PicSight®-GigE Series, Getting Started

User manual for Leutron Vision GigE Vision cameras

Leutron Vision

PicSight®-GigE Series, Getting Started: User manual for Leutron Vision GigE Vision cameras

Leutron Vision

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General information

Scope of the manual

This manual introduces the PicSight®-GigE camera family and covers all common aspects of work with these cameras. Complete technical specifications and other model-specific data will be provided in a separate document for each model (see PicSight® homepage[1]).

Related documents

- LV-SDS support and troubleshooting guide — how to get support and troubleshoot Leutron Vision products.
- PicSight®-CL user's manual — getting started guide for our Camera Link camera series.
- PicSight®-USB user's manual — getting started guide for our USB camera series.
- Index — entry point for Leutron Vision documentation.

[1] http://www.picsight.com

Where do I find…?

The following points could help you to search for some important piece of information within this manual:

- GigE Vision & GenICam: Section 1.4.1, “GigE Vision & GenICam” [p. 9], Section 4.1, “GigE Vision & GenICam compatibility” [p. 32]
- Technical specifications: Section 1.8, “Technical specifications” [p. 12], Appendix A, *Technical specifications for individual models* [p. 64]
- Basic configuration through embedded HTTP server: Section 5.3, “HTTP-based configuration” [p. 53]
- Network settings and other configuration: Chapter 5, *Camera configuration* [p. 49]
- Using “filter driver” to improve performance: Section 3.6, “Using the “network filter driver”” [p. 30]
- Test the camera: Section 4.5, “PicSight® demo” [p. 48], Section 5.3.3, “Getting an image in a web browser” [p. 55]
- Release notes (revision history): PicSight®-GigE & PicSight®-Smart revision history
- Looking for something else? Try Table of contents.

1. Introduction

1.1. Product package

The PicSight® cameras are available as an “OEM product” or as a “Standard product”.

1.1.1. OEM product

The OEM product consists of the hardware only without any documentation or software. Thus every OEM should buy a Standard product first.

1.1.2. Standard product

The standard product has the same contents as OEM product plus

- Software tools:
  - LV-SDS when purchased and used together with a Leutron Vision frame grabber (applies to Camera Link models) or when being accessed over a proprietary protocol (applies to GigE Vision and USB models). LV-SDS contains device drivers, libraries and tools covering complete functionality of all Leutron Vision hardware products. Please refer to LV-SDS documentation to learn complete list of its libraries and tools. LV-SDS license is subject to an extra charge.
  - LV-Camera Kit when purchased separately or used with a 3rd party frame grabber and software package. LV-Camera Kit is provided free of charge. It contains basic tools necessary for camera control: Camera Control Library and Camera Control Tool.
- Complete documentation

1.2. Precautions

Not respecting these precautions can lead to injury, camera damage, incorrect camera performance and loss of warranty.

- **Read the documentation.** Read the camera documentation before using the camera.
- **Camera power.** Incorrect input power can damage the camera. Follow guidelines in Section 2.6, “DC power input” [p. 20]. Do not reverse power polarity. Do not connect or disconnect other cables when the camera power is on.
- **Opening the camera.** Do not open the camera. Do not let liquid, dust, flammable or metallic material to get inside the camera.
- **Environment.** Always use the camera in conditions meeting the requirements specified in Section 1.3, “Environmental requirements” [p. 9]
- **Cleaning the sensor window.** Avoid cleaning the sensor window if possible. Keep lens cap closed as long as no lens is attached, avoid touching the sensor. If necessary, clean the sensor window using compressed air. If further cleaning is required, use lint-free, ESD-safe cloth wiper. Avoid cloth that could generate static charge or that could scratch the window. The camera should be cleaned in an ESD-safe area, the person performing cleaning should be earthed.
- **Electromagnetic fields.** Keep the camera away from strong electromagnetic fields. Avoid static charging, handle the camera in ESD protected area.

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- **Connectors.** Take care when handling the camera so that no damage can be done to the connectors. Prevent foreign objects in the connectors.
- **Transporting the camera.** Always transport the camera in its original packaging.

1.3. Environmental requirements

- Operating temperature: 0–50 °C
- Operating relative humidity: 20–95 %, non-condensing
- Allow sufficient air circulation around the camera to prevent heat-up

If exposed to environment conditions outside the specified limits, camera performance can be significantly degraded or the camera can be damaged.

1.4. Standard conformity

1.4.1. GigE Vision & GenICam

- The cameras implement the GigE Vision standard and were properly registered as GigE Vision compliant devices with AIA.
- The cameras fully implement the GenICam standard, including the Standard Feature Naming Convention (SFNC).

Because the camera is GigE Vision compliant, you don't need to install any Leutron Vision software if you don't want to. The camera will work with any GigE Vision compatible software package.

The GigE Vision standard dictates, that the factory default settings of the camera must disable the fix IP address and that the cameras must be delivered with DHCP as the primary IP configuration option. The PicSight®-GigE cameras deliberately violate that requirement to allow for straightforward HTTP based configuration (see Section 1.4.2, "HTTP & FTP (configuration, testing, updates)" [p. 9] and especially Section 5.3, "HTTP-based configuration" [p. 53]). The cameras are by default delivered with fixed IP address, allowing user to connect to it over HTTP protocol using a regular web browser and perform the basic configuration without need to run any special software.

The cameras can be delivered in the DHCP IP configuration mode (exactly following the GigE Vision specification) on request.

1.4.2. HTTP & FTP (configuration, testing, updates)

The PicSight®-GigE cameras are running a dedicated HTTP server with CGI interface. This allows to connect to the camera using any web browser, and perform configuration of the most important camera settings without even starting any special software. On top of that simple live image might be acquired through this HTTP interface, allowing thus to verify the basic camera functionality again without starting dedicated software. The cameras are by default delivered with fix IP address (`192.168.1.55`), making the HTTP configuration straightforward. To learn all details about the HTTP camera configuration, please refer to Section 5.3, "HTTP-based configuration" [p. 53].

The PicSight®-Smart cameras (Section 3.7, "PicSight®-Smart models" [p. 31]) implement also the FTP protocol allowing the smart application developer to upload specific data to the camera using any standard FTP client.

1.4.3. CE & FCC

- The cameras fulfill EMC standards 55022:1998/A1:2000/A2:2003 (emissions) and 55024:1998/A1:2001/A2:2003 (immunity).
- The equipment complies with the requirements of a FCC part 15 Class A Digital Device, the FCC Mark is not applicable for Class A products

1.4.3.1. Declaration of conformity

DECLARATION OF CONFORMITY
KONFORMITÄTSERKLÄRUNG

Leutron Vision

Equipment: *Geräteart:*	**Digital Camera**
Brand: *Handelsmarke:*	**PicSight**
Type: *Typ:*	**PicSight GigE**
Further Description: *Weitere Angaben:*	**See technical data sheet** *Siehe Technisches Datenblatt*

The signing legal authorities state that, the above-mentioned equipment meets the requirements for EMC according to:

DIRECTIVE OF COUNSEL 89 / 336 / EEC, Electromagnetic Compatibility EMC

Die Unterzeichnenden erklären als rechtsverbindliche Bevollmächtigte, dass das oben erwähnte Gerät den folgenden EMV-Anforderungen entspricht.

RICHTLINIE DES RATES 89 / 336 / EWG, Elektromagnetische Verträglichkeit EMV

The following harmonized standards have been used:
Folgende harmonisierte Normen wurden angewandt:

EN 55022: 1998 + A1:2000 + A2:2003
EN 55024: 1998 + A1:2001 + A2:2003

The equipment complies with the requirements of:
Das Gerät erfüllt die Vorschriften eines:

FCC part 15 Class A Digital Device

It was verified by the Verification procedure.
Die Vorschriften wurden verifiziert durch die Verifikationsprozedur

Test report for EMC: *Prüfbericht für EMV:*	**Test results, diagrams** *Testresultate, Diagramme*
Test Laboratory:	**EMC-Testcenter Zurich AG, Postfach 268, CH-8052 Zürich accredited according to ISO / IEC 17025**
Prüfstelle:	*EMC-Testcenter Zürich AG, Postfach 268, CH-8052 Zürich akkreditiert gemäss ISO / IEC 17025*
Manufacturer Name: *Hersteller:*	**Leutron Vision AG, CH-8152 Glattbrugg**
Authority: *Bevollmächtigter:*	Mathias Leumann, President

Glattbrugg	19. Mai 2006	
City *Ort*	**Date** *Datum*	**Signature** *Unterschrift*

1.4.3.2. Regulatory notices

The cameras should be used with properly shielded cables (and other equipment) recommended in this manual.

Please contact us if you need further information regarding the necessary equipment.

1.4.4. RoHS

All units delivered after June 30, 2006 are RoHS compliant.

1.5. PicSight® model naming convention

To better understand PicSight® model names, we outline below the basic rules used for naming PicSight® cameras. This reference should help you understand the camera names and the available camera options. Note that this explanation is just a hint, the naming convention can be changed any time in future.

Every PicSight® name has following form: **`Annnm(R)C-I-(M)`**. Meaning of individual name components is explained below:

`A` Sensor type. Possible values are:
- `P` — CCD sensor, progressive scan, interline transfer
- `G` — CMOS sensor with global shutter
- `R` — CMOS sensor with rolling shutter
- `T` — CCD sensor, progressive scan, frame transfer
- `F` — CCD sensor, progressive scan, frame readout
- `I` — CCD sensor, interlaced (2 or multiple fields)

`nnn` Total number of pixels divided by 100000 and rounded. Leading zeroes are not displayed (which results in 1–3 digit number).

`m` Imager size. Possible values are:
- `0` — 1" or bigger
- `1` — 2/3" or bigger
- `2` — 1/2", 1/1.8" or bigger
- `3` — 1/3", 1/2.7" or bigger
- `4` — 1/4" or bigger
- `5` — 1/5" or bigger
- `6` — 1/6" or bigger

`R` Optional. Revision. Allows to distinguish a new revision of the same sensor of other manufacturer or another, very similar sensor with same basic properties. The original model has the revision flag omitted. Additional revisions are flagged with `A`, `B`, etc.

`C` Color coding. Possible values are:
- `M` — monochrome
- `I` — monochrome, IR sensitive
- `B` — Bayer encoded color

`I` Interface. Possible values are:
- `GigE` — GigE Vision (gigabit Ethernet)
- `PoCL` — Camera Link (variants marked as "`CL`" or "`CL-PoCL`" exist)
- `USB2` — USB 2.0
- `Smart` — smart camera (gigabit Ethernet version with on-camera processing)
- `ANALOG` — for analog version of the camera

`M` Optional. Defines additional features available for a given model. For basic model version (no additional features) it is omitted. The additional features might be for example:
- `R` — real time functions (like Bayer decoder, shadow correction, etc.)
- `H` — horizontal, 90° lens mount (available for PicSight®-GigE only)
- Smart501 — "smart" camera (available for PicSight®-GigE only)

1.6. PicSight®-GigE camera options summary

Every PicSight®-GigE basic model can be further customized using one of following options:

90° camera head — Instead of the standard case, the camera might be delivered in case where the camera head (chip) is right angle (90°) oriented. See drawings of both versions in Section 2.1, “Dimensions” [p. 14].

IR-cut filter — By default, the PicSight®-CL cameras are delivered with a IR-cut filer mounted on top of the sensor. Optionally, every PicSight®-CL model can also be delivered without this filter. See more details in Section 2.5, “IR-cut (or other) filter” [p. 19]. Query us about possibility to deliver the camera with other (e.g. daylight blocking) filter.

Lens mount — The cameras can be delivered with CS-mount optical head instead of the standard C-mount version. However, this option is available only for high quantity OEMs.

Other options might be available for high quantity OEMs, please contact Leutron Vision for more information.

1.7. PicSight®-GigE camera accessories

Following accessories are available for PicSight®-GigE cameras:

Power supply — DC power supply for PicSight®-GigE cameras (ordering number 73509). See also Section 2.6, “DC power input” [p. 20].

Tripod adapter — 44×87.50×8 mm tripod adapter tripod adapter (ordering number 999010). See also Section 2.4, “Mounting points” [p. 19].

More accessories might be available. Check latest price list or contact Leutron Vision to get an update.

1.8. Technical specifications

This manual serves as a general introduction to the PicSight®-GigE camera family, describing their common features and usage instructions. Technical specifications and other model-specific data is provided in Appendix A, *Technical specifications for individual models* [p. 64]. See also data sheets or other documents available at PicSight® homepage[1].

The table below serves as overview of the common (or similar) properties of all PicSight®-GigE cameras. Whenever a different value appears in the technical specification document of each respective camera model, it overrides the value in this table.

Specification	**PicSight®-GigE**
Interface	Gigabit Ethernet
Resolution	model specific
Frame rate	model specific
Video format	• up to 12–bit, progressive scan • all models available as monochrome or Bayer encoded

[1] http://www.picsight.com

Specification	PicSight®-GigE
Sensor types	• interline transfer CCD • frame transfer CCD • global shutter CMOS • rolling shutter CMOS
Trigger mode	• free running • pulse width (currently not available for CMOS sensors) • edge preselect
Shutter time	20 µs up to 1 frame (may vary between models)
Power	10-26 V DC (12 V DC for old models, refer to Section 2.6, "DC power input" [p. 20]), power consumption is model specific
Dimensions	• 44.8×31.4×92.51 mm (W×H×L, without connectors) — the standard version • 44.8×37.41×95.9 mm (W×H×L, without connectors) — the right angle version
Weight	145 g
Lens mount	C-mount (CS-mount on request)
Connectors	• standard Ethernet connector • Hirose 12–pin i/o connector • Hirose 6–pin power input connector • SDR 26-pin universal connector
Environment	see Section 1.3, "Environmental requirements" [p. 9]
Options	see Section 1.6, "PicSight®-GigE camera options summary" [p. 12]
Accessories	see Section 1.7, "PicSight®-GigE camera accessories" [p. 12]
Standards	GigE Vision, GenICam, CE, FCC, RoHS
Software	• camera control tool and library (in free LV-Camera Kit) • full featured SDK (in LV-SDS, when used with Leutron Vision frame grabbers
Firmware	field upgradeable
All other features are strictly model specific. Please refer to additional information in Appendix A, *Technical specifications for individual models* [p. 64] or to further explanations in this manual.	

Table 1.1. PicSight®-GigE technical specifications overview

2. Hardware interface and installation

2.1. Dimensions

The following figure shows mechanical dimensions of the PicSight®-GigE cameras, location of the connectors, location and size of the mounting screws.

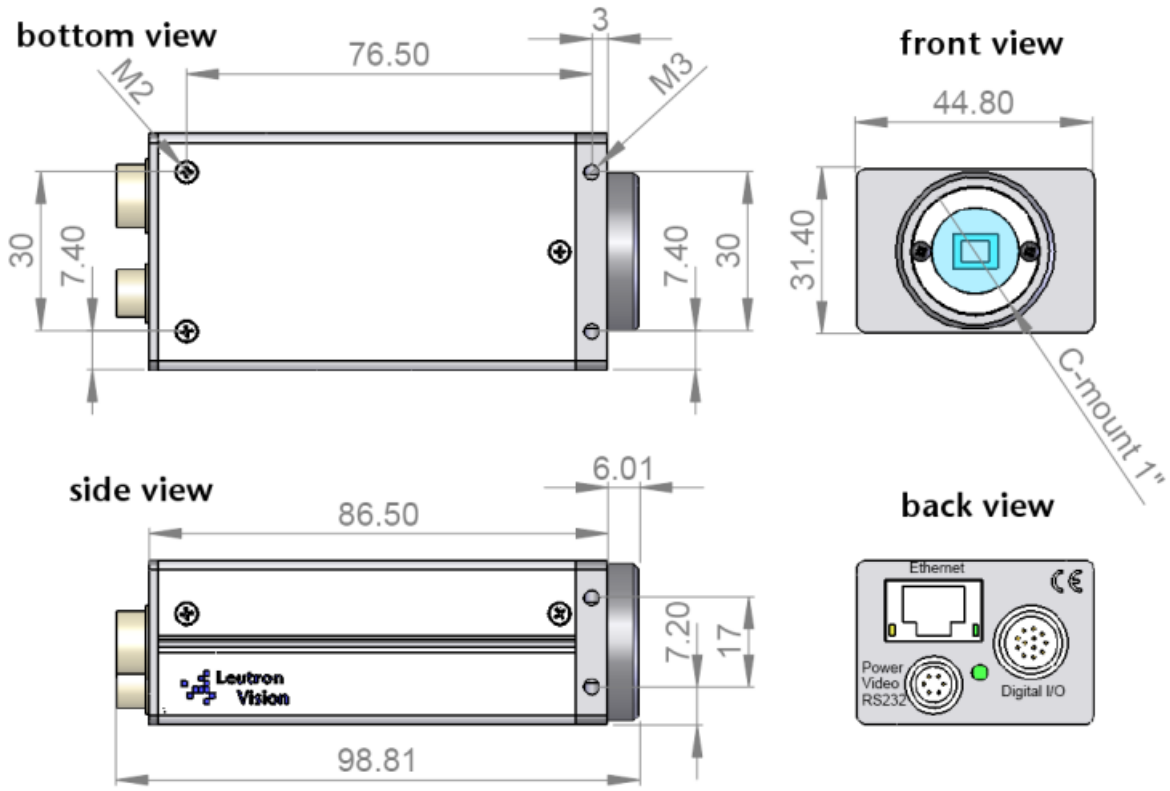

Figure 2.1. PicSight®-GigE dimensions

The PicSight®-GigE cameras are also available in alternative version of the camera case with 90° lens mount orientation.

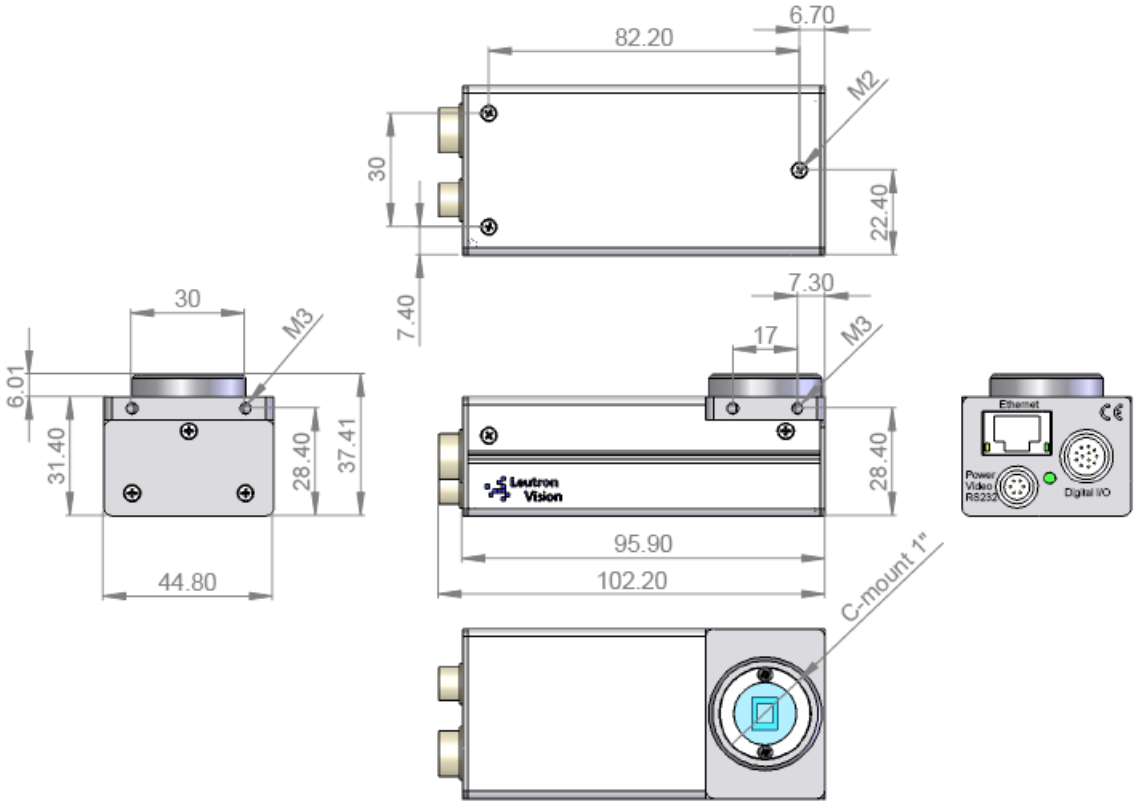

Figure 2.2. PicSight®-GigE dimensions, version with 90° lens mount

2.2. Connector and cable description

2.2.1. Ethernet connector

A standard Ethernet connector, 8P8C modular plug, often also referred to as RJ-45. Refer to the corresponding Ethernet specifications for more details.

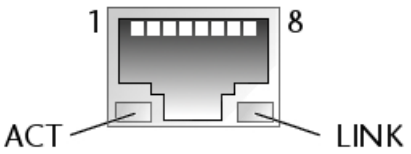

Figure 2.3. Ethernet connector

Pin	Wire color code	Signal (1000BASE-T)	Signal (10BASE-T, 100BASE_TX)
1	white/green	BI_DA+	TX+
2	green	BI_DA-	TX-
3	white/orange	BI_DB+	RX+
4	blue	BI_DC+	NC
5	white/blue	BI_DC-	NC
6	orange	BI_DB-	RX-
7	white/brown	BI_DD+	NC

Pin	Wire color code	Signal (1000BASE-T)	Signal (10BASE-T, 100BASE_TX)
8	brown	BI_DD-	NC

Table 2.1. Ethernet connector, pinout

The color scheme and pinout shown in the table above applies for the straight-through cables (cable wiring standard EIA-568-A). For cross over cable, wire pairs 1–3, 2–6, 4–7 and 5–8 had to be crossed. Refer to official Ethernet connector and cabling specifications in case of any doubts.

2.2.2. Power input connector

Hirose 6–pin male connector (HR10A-7R-6PB-73) for 12 V DC power input.

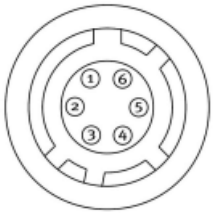

Figure 2.4. Power input connector (male)

Pin	Signal	1	2	3	4	5	6	7	8
1	TxD output (RS-232 interface)	✗	✓	✗	✗	✓	✗	✗	✗
2	RxD input (RS-232 interface)	✗	✓	✗	✗	✓	✗	✗	✗
3	Ground	✓	✓	✓	✗	✓	✗	✓	✗
4	Reserverd Video out CVBS	✗	✓	✗	✗	✓	✗	✓	✗
5	Ground	✓	✓	✓	✗	✓	✗	✓	✗
6	10-26 VDC power input	✗	✗	✓	✗	✓	✗	✓	✗
6	power input for old camera models **12 V DC only !!** (see Section 2.6, “DC power input” [p. 20])	✓	✓	✗	✗	✗	✗	✗	✗

Camera models:

1 — PicSight®-GigE
2 — PicSight®-Smart501
3 — PicSight®-GigE-AR
4 — PicSight®-GigE-AS
5 — PicSight®-Smart502/702-AR
6 — PicSight®-Smart502/702-AS
7 — PicSight®-GigE-AR-RTF
8 — PicSight®-GigE-AS-RTF

Table 2.2. Power input connector signals

2.2.3. I/O connector

Hirose 12–pin male connector (HR10A-10R-12PB-71) for digital i/o (TTL trigger input, optocoupler i/o).

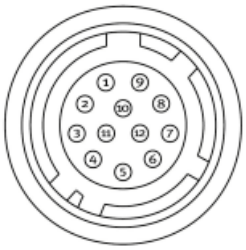

Figure 2.5. Digital I/O connector (male)

Pin	Signal	1	2	3	4	5	6	7	8
1	Opto output tap	✓	✓	✓	✓	✓	✓	✓	✓
2	Opto output common emmiter	✓	✓	✓	✓	✓	✓	✓	✓
3	Opto output collector 0	✓	✓	✓	✓	✓	✓	✓	✓
4	Opto output collector 1	✓	✓	✓	✓	✓	✓	✓	✓
5	Opto output collector 2	✗	✗	✓	✓	✓	✓	✓	✓
6	TTL trigger output (5V), fix driven	✗	✗	✓	✓	✓	✓	✓	✓
7	10-26 VDC power input	✗	✗	✓	✓	✓	✓	✓	✓
8	Output input 1 (any polarity)	✓	✓	✓	✓	✓	✓	✓	✓
9	Output input 0 (any polarity)	✓	✓	✓	✓	✓	✓	✓	✓
10	Opto input common (any polarity)	✓	✓	✓	✓	✓	✓	✓	✓
11	TTL trigger input (5V)	✓	✓	✓	✓	✓	✓	✓	✓
12	Ground	✓	✓	✓	✓	✓	✓	✓	✓
Camera models: 1 — PicSight®-GigE 2 — PicSight®-Smart501 3 — PicSight®-GigE-AR 4 — PicSight®-GigE-AS 5 — PicSight®-Smart502/702-AR 6 — PicSight®-Smart502/702-AS 7 — PicSight®-GigE-AR-RTF 8 — PicSight®-GigE-AS-RTF									

Table 2.3. Digital i/o connector signals

2.2.4. Universal I/O connector

SDR 26-pin female connector for digital i/o (TTL trigger input, optocoupler i/o) and lens control.

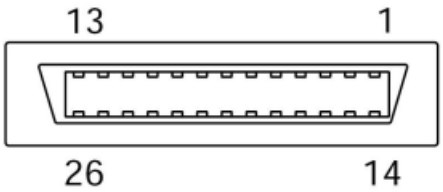

Figure 2.6. Universal I/O connector (female)

Pin	Signal	1	2	3	4	5	6	7	8
1	Lens ground	✗	✗	✗	✗	✗	✓	✗	✓
2	Feedback voltage input of motor 3 (Iris)	✗	✗	✗	✗	✗	✓	✗	✓
3	Feedback voltage input of motor 2 (Focus)	✗	✗	✗	✗	✗	✓	✗	✓

Pin	Signal	1	2	3	4	5	6	7	8
4	Feedback voltage input of motor 1 (Zoom)	✗	✗	✗	✗	✗	✓	✗	✓
5	Positive reference voltage for feedback resistors of lens	✗	✗	✗	✗	✗	✓	✗	✓
6	Ground	✗	✗	✗	✓	✗	✓	✗	✓
7	Lens Motor 3 - (Iris)	✗	✗	✗	✗	✗	✓	✗	✓
8	Lens Motor 3 + (Iris)	✗	✗	✗	✗	✗	✓	✗	✓
9	Lens Motor 2 - (Focus)	✗	✗	✗	✗	✗	✓	✗	✓
10	Lens Motor 2 + (Focus)	✗	✗	✗	✗	✗	✓	✗	✓
11	Lens Motor 1 - (Zoom)	✗	✗	✗	✗	✗	✓	✗	✓
12	Lens Motor 1 + (Zoom)	✗	✗	✗	✗	✗	✓	✗	✓
13	External power input for lens motors (max.24V)	✗	✗	✗	✗	✗	✓	✗	✓
14	Video out CVBS	✗	✗	✗	✗	✗	✓	✗	✓
15	Reserved for future use, DO NOT CONNECT!	✗	✗	✗	✗	✗	✗	✗	✗
16	Reserved for future use, DO NOT CONNECT!	✗	✗	✗	✗	✗	✗	✗	✗
17	Video ground	✗	✗	✗	✗	✗	✓	✗	✓
18	Reserved for future use, DO NOT CONNECT!	✗	✗	✗	✗	✗	✗	✗	✗
19	Reserved for future use, DO NOT CONNECT!	✗	✗	✗	✗	✗	✗	✗	✗
20	Reserved for future use, DO NOT CONNECT!	✗	✗	✗	✗	✗	✗	✗	✗
21	10-26 VDC power input	✗	✗	✗	✓	✗	✓	✗	✓
22	Reserved for future use, DO NOT CONNECT!	✗	✗	✗	✗	✗	✗	✗	✗
23	Reserved for future use, DO NOT CONNECT!	✗	✗	✗	✗	✗	✗	✗	✗
24	Reserved for future use, DO NOT CONNECT!	✗	✗	✗	✗	✗	✗	✗	✗
25	RxD (RS-232 interface)	✗	✗	✗	✗	✗	✓	✗	✗
26	TxD (RS-232 interface)	✗	✗	✗	✗	✗	✓	✗	✗

Camera models:

1 — PicSight®-GigE
2 — PicSight®-Smart501
3 — PicSight®-GigE-AR
4 — PicSight®-GigE-AS
5 — PicSight®-Smart502/702-AR
6 — PicSight®-Smart502/702-AS
7 — PicSight®-GigE-AR-RTF
8 — PicSight®-GigE-AS-RTF

Table 2.4. Universal i/o connector signals

2.3. Lens mount, optical head

All PicSight® models are equipped with a C-mount optical head (1–inch thread diameter, 32 threads per inch, 17.526 mm flange back). CS-mount version (identical, only with 12.5 mm flange back) is available on request for high volume OEM customers.

Few different camera head versions are used for PicSight® cameras to compensate for different shape (thickness) of individual sensor modules. This guarantees proper flange back 17.526 mm (distance between lens flange and the focal plane, i.e. sensor surface) as specified for C-mount. This has to be taken in account by OEMs (re)assembling the cameras. The different camera head versions are marked using little holes on side to prevent confusion. Contact Leutron Vision for more details.

2.4. Mounting points

The camera provides 8 standard mounting points on the camera head sides, two on each side (top, bottom, left, right), see Figure 2.1, “PicSight®-GigE dimensions” [p. 14]. Use M4 screws going no deeper than 4 mm to the camera body for fixing the camera.

If these mounting points are not enough, you can additionally dismount the two M2 screws (use TORX screwdriver number 6) on the bottom part of camera's case and replace them with your own screws for fixing the camera. The screws should not go deeper than 4 mm into the camera body.

If the screws go deeper than 4 mm into the camera body, you can destroy the camera.

2.5. IR-cut (or other) filter

The PicSight® cameras have by default an IR-cut filter mounted on top of the sensor. User has however an option to choose from different configurations:

- IR-cut filter mounted on top of the sensor (default).
- Clear glass filter (of the same size as the original IR-cut filter) mounted on top of the sensor. Check, whether you don't need special lens designed for specifically for use without IR-cut filter (common lens might not focus properly in the infrared band or show other problems).
- Without any sensor cover mounted. This has impact on optical properties of the camera — the C-mount flange distance from the sensor is accurately adjusted for the use of the IR-cut filter and removing the filter decreases the length of the optical path. With some lenses and working area setups it can become impossible to focus properly.
- Ask us for other possibilities, such as daylight blocking filters.

User should understand what impact such options can have on the image quality and lens choice and choose option best suiting given application.

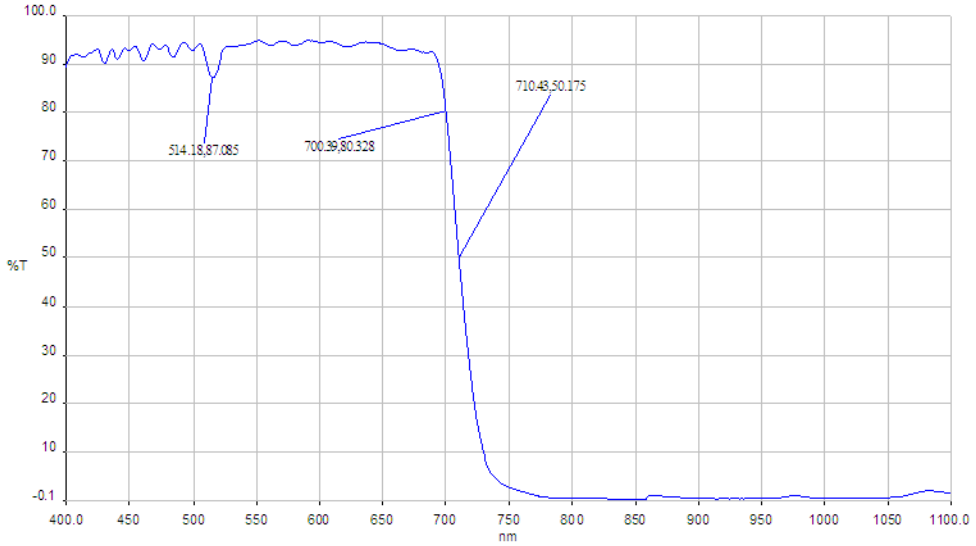

Figure 2.7. IR-cut filter spectral characteristics

2.5.1. Changing or removing the filter

The filter is accessible from outside the camera and user can change it without loose of warranty. It is very important to do this operation with maximum care so that the image sensor cannot be damaged.

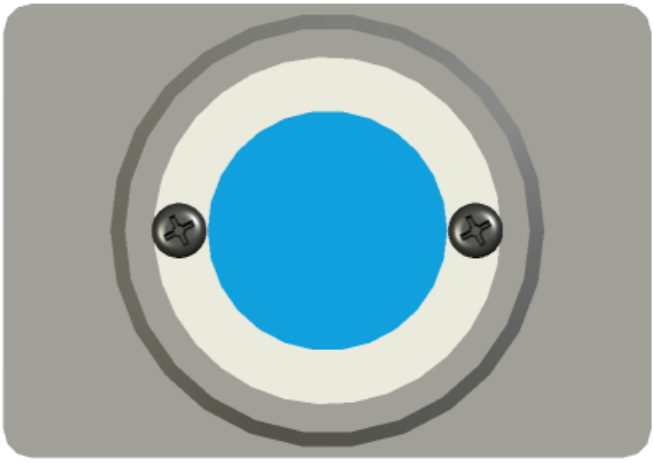

Figure 2.8. IR-cut filter fixing screws

If exchanging the filter for another type, it is highly recommended to choose a filter of the same size, not to change the optical properties of the system. Removing the filter completely will change the length of the optical path which can lead to focusing problems in some scenarios.

To mount/dismount the filter, you will need a TORX screwdriver number 6 (note that some of the first units used hexagonal screws instead). The fixing screws are M2×3.

2.6. DC power input

PicSight®-GigE cameras power requirements differ for different revisions of the cameras:

- The new models (those with "-AR" or "-AS" in their name, such as G32B-GigE-AR) accept 10–26 V DC power input.
- The old models (those without "-AR" "or -AS" in the name) accept **only 12 V DC** power input.

The power consumption varies among individual models.

The PicSight®-GigE models are equipped with a 6–pin Hirose connector for power supply input, see its description in Section 2.2.2, "Power input connector" [p. 16]. The cameras are also delivered with a suitable power supply.

2.7. Ethernet connection

The PicSight®-GigE is fully compatible with the industry-standard Ethernet LAN equipment.

It can be connected directly to the host PC (point-to-point connection). In such case a cross over cable must be used and the cable length can be up to 100 meters. Note that in case of multiple Ethernet adapters in the host PC, each one must be configured with a different subnet.

Or it can be connected to a network with one or more switches between the PicSight®-GigE and the host PC. As the PicSight®-GigE complies with the IP protocol standard, it should work with all standard Ethernet switches. However, the functions and performance grade of the switch can

significantly influence the performance of the image transfer and thus care must be taken in order to select an appropriate switch.

For optimal performance the network with the Gigabit Ethernet (1000BASE-T) components should be used. In the host PC it is recommended to use a network adapter (NIC) with the Intel PRO/1000 chipset.

The switch should be non-blocking, it should support “Jumbo Frames” and have memory buffers of sufficient size. See Section 5.4, “Advanced network settings” [p. 55] for more details.

The PicSight®-GigE cameras were successfully tested with the following switches:

- Netgear GS116 (www.netgear.com[1], jumbo frames are supported since serial number starting at 19E or 140x5B or 140x5C)
- Longshine LCS-GS7108-A (www.longshine.de[2])
- SMC 8508T EZ (www.smc.com[3])

It is recommended to use a switch with the same specification as one of those specified above.

2.8. The optocoupler interface

For use in industrial environment, PicSight®-GigE and PicSight®-USB cameras provide I/O signals isolated by use of optocouplers with variable 5V to 24V interface. The optocoupler inputs are polarity independent. To take full profit of this signal isolation, you have to connect the optocoupler to an external power supply. The following figure shows the common way, how to connect the optocoupler to an external power source of 5-24 Volt. Input maximal diode current is 50 mA. Output maximal collector current is 50 mA. Input delay varies a lot with diode current and temperature. Output delay varies a lot with TAP voltage and temperature.

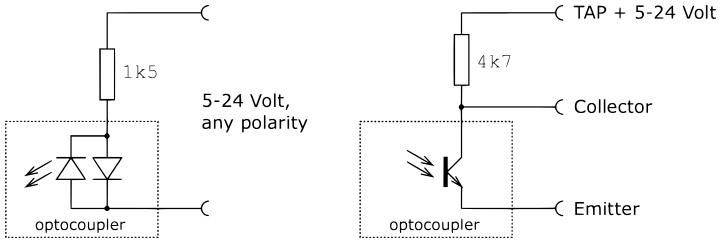

Figure 2.9. Using optocoupler inputs and outputs

The optocoupler interface can be used for trigger input (Section 3.3.1, “Trigger input” [p. 28]) as well as for user defined I/O purposes.

The optocoupler device used is Toshiba TLP280. Refer to its specification, if details are needed.

2.9. Status LED

A status LED is placed on the back side of the camera (see Figure 2.1, “PicSight®-GigE dimensions” [p. 14]). During camera boot (after powering the camera) this LED is blinking irregularly. As soon as the camera booted successfully and is ready for operation, the LED should start blinking regularly with period of approx. 2 seconds If the status LED remains blinking irregularly en error occurred during boot up. If the problem repeats in successive boots, the camera might need a firmware update or other service operation.

[1] http://www.netgear.com
[2] http://www.longshine.de
[3] http://www.smc.com

As soon as the camera boots, the LED's on the Ethernet connector should also start shining. The LED on the right side of the connector indicates a connection to a host and its color indicates the connection speed: green for 100 Mb/s, red for 1 Gb/s. The yellow LED on the left side indicates the traffic. If any of these two LED's is not shining, you should recheck the Ethernet cable connection.

2.10. Firmware update

The camera firmware can be updated from a PC with Windows. The update tool is included with LV-SDS since the version 1.96.169. It is located in the `bin` folder of the LV-SDS installation (usually `C:\LVSDS`) and its name is `PicSightGigEUpdater.exe`. The packages with the updated software can be downloaded from our download area[4].

During the update process the needed files are first fully uploaded to the PicSight®-GigE flash memory, and then, after successful upload, the system is switched from the previous version to the new one. Thus, if the upload of files fails for any reason, the original system remains untouched and the firmware update can be done again after PicSight®-GigE reboot. However, in case the failure in communication would happen during the system switching (which takes only a very small part of the update process, so the probability that it happens is also small), the PicSight®-GigE may get into a status, in which it is not able to boot anymore. In such case the “Recover Mode” must be used to boot.

2.10.1. The “recover mode”

For the case the PicSight®-GigE system fails to load, a recover copy of the system is available in the PicSight®-GigE flash memory. This system is limited in functionality (does not enable acquisition and streaming) and serves only for fixing the normal system.

To boot the recover system, you should follow one of the following options:

- Press the “Reset” button placed on the back plate of the PicSight®-GigE camera (see Section 2.1, “Dimensions” [p. 14]) during camera boot, i.e. hold down the reset button within 5 seconds right after powering a camera. Note that the initial versions of PicSight®-GigE might not be equipped with the Reset button — in this case you need to create a special connector as described in next step of recovering procedure.

- Older camera models without Reset button such as

  — PicSight®-GigE

  — PicSight®-Smart501

  demand the special connector to be created for loading the recover system during boot. Please note, that newest models have been completely redesigned and **using the connector for different models can DAMAGE a camera!**

  Create a special connector, where you connect the RX and TX signals of the RS-232 interface (pins 1 and 2 on the small 6-pin Hirose connector, see Section 2.2.2, “Power input connector” [p. 16]). Note that the “Reset” button is just a convenience option for connecting the RX/TX RS-232 signals, it does internally the very same thing.

When the “Reset” button is being pressed (RX and TX are connected) during the boot process (i.e. within 5 seconds after power up), the recover system is loaded. The LED light blinks slower than with the normal system. You can also check the system on the home page of PicSight®-GigE (when accessing the camera over HTTP, see Section 5.3, “HTTP-based configuration” [p. 53]), which is colored differently and displays additional “*** RECOVER MODE ***” label:

[4] http://www.leutron.com/download/index.htm

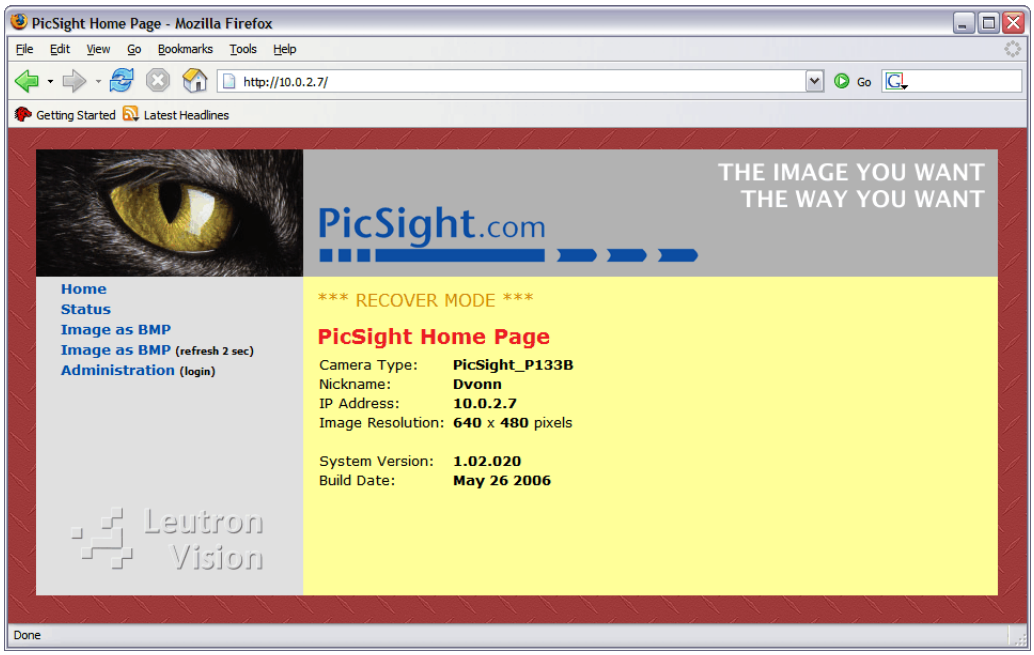

Figure 2.10. PicSight®-GigE homepage, recover mode

Note that the check of the RX-TX connection is not reliable, you may need to repeat the boot to load the recover system successfully.

The recover system enables the firmware update tool to communicate with the camera in the same way as with the normal system. So you can then use the firmware update tool to fix the broken system.

Note that the recover system has its own network configuration. Unless this was changed, the recovery system uses the default IP address `192.168.1.55` for the PicSight®-GigE. Thus you may need to adapt your local subnet configuration to access it, see Section 5.2, “Checking the connection” [p. 51] for details.

The changes in the configuration, made through the HTTP-based configuration when the recover system is loaded, are made to the normal system, not to the recover system.

3. Camera features and operation

3.1. Sensor types

3.1.1. Progressive scanning

All PicSight® cameras provide progressive scan video output. The camera outputs full frame data in sequential order (no field interlacing).

3.1.2. CMOS vs. CCD

Leutron Vision PicSight® series offers models with both CMOS and CCD sensors worlds, providing advantages of both technologies.

While CCD chips have reputation of great image quality and high sensitivity, CMOS imagers usually offer higher resolution and dynamic range. But the decision should always be made camera by camera, application by application. PicSight® camera series provides wide choice of CCD and CMOS sensors to cover wide range of applications.

3.1.3. CMOS: global vs. rolling shutter

Some of the PicSight® cameras with large CMOS sensors are equipped with a rolling shutter. In contrary to the global shutter, where all camera pixels are exposed at exactly the same time, with rolling shutter the exposure of every single line is slightly time-shifted relative to the previous line. This requires some special considerations, especially when capturing moving objects. Flash illumination is desirable.

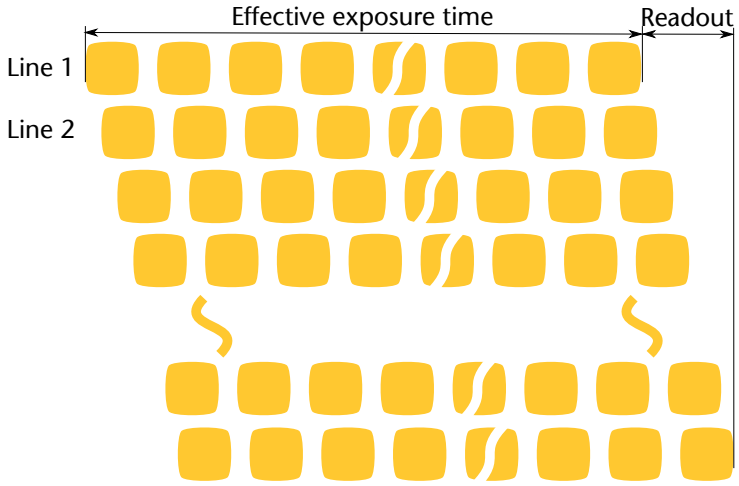

Figure 3.1. Rolling shutter

3.1.4. CCD readout types

Most of the PicSight® CCD sensors are designed with interline transfer readout. These sensors have photosensitive pixels organized in columns with light-shielded registers in between them. Upon exposure end the charge from the photosensitive cells is quickly transferred to these storage registers. It is then read out from these registers sequentially, line by line, pixel by pixel and sent to the camera output.

One of the cameras is an exception from this rule, possessing a sensor with frame transfer readout. Such chip is divided into two distinct regions, one photosensitive, the other light-shielded. Upon

the exposure end the charge is quickly transferred from the photosensitive area to the storage part of the sensor. Then the image is sent sequentially to the output as usual.

3.2. Trigger modes

The following sections give an overview of the trigger modes supported by PicSight® cameras. Detailed timing specifications are model specific.

3.2.1. Free running mode

In the free running mode no external triggers are considered by the camera. A continuous video stream with constant frame rate (see Appendix A, *Technical specifications for individual models* [p. 64]) is output by the camera. Exposure time can be software programmed (Chapter 5, *Camera configuration* [p. 49]) in certain limits (see Appendix A, *Technical specifications for individual models* [p. 64]).

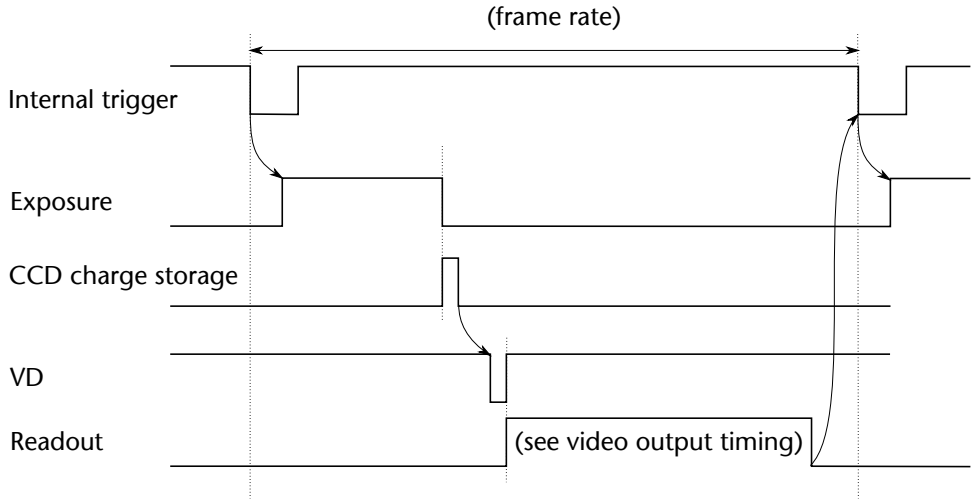

Figure 3.2. Free running mode timing

3.2.2. Pulse width mode

In the pulse width mode both the leading and trailing edges of the trigger pulse are significant. The leading edge starts the exposure and the trigger length then controls the exposure time.

The trigger should be delivered through the TTL trigger input line on the Hirose 12–pin i/o connector (see Section 3.3.1, "Trigger input" [p. 28]). The trigger pulse duration should be at least 2 H, trigger overlapping is not supported. The exposure time can be programmed (using the trigger pulse width) approximately in range 10 µs to 2–3 s (see Appendix A, *Technical specifications for individual models* [p. 64]).

When using the TTL trigger input, the external trigger signal fully controls the exposure, no shutter time control is possible through the software interface When the trigger input is configured on other input line, only the starting edge is considered, the pulse duration is formed internally by the camera and is software configurable. This is compatibility mode with our Camera Link product line. See also Section 3.3.1, "Trigger input" [p. 28].

The pulse width mode is currently not supported on the CMOS PicSight® cameras.

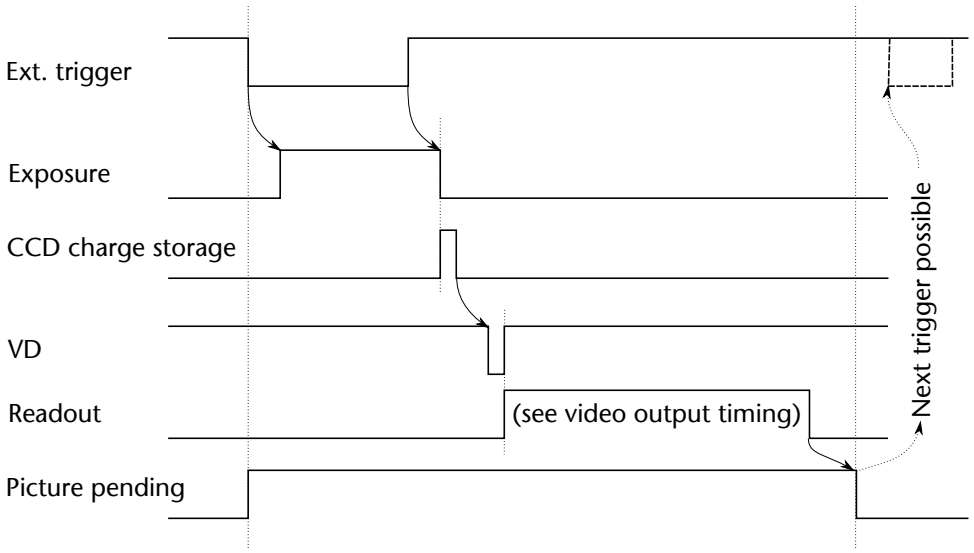

Figure 3.3. Pulse width mode timing

3.2.3. Edge preselect mode

In the edge preselect mode only the leading edge of the trigger pulse is significant. When encountered an exposure starts. The length of the exposure is to be software programmed through the LV-SDS interface (Chapter 5, *Camera configuration* [p. 49]).

The trigger should be delivered through one of the input lines of the Hirose 12–pin i/o connector (see Section 3.3.1, “Trigger input” [p. 28]). The trigger pulse duration should be at least 2 H, trigger overlapping is not supported. Exposure time can be programmed approximately in range 20 µs to 1 frame (see Appendix A, *Technical specifications for individual models* [p. 64]).

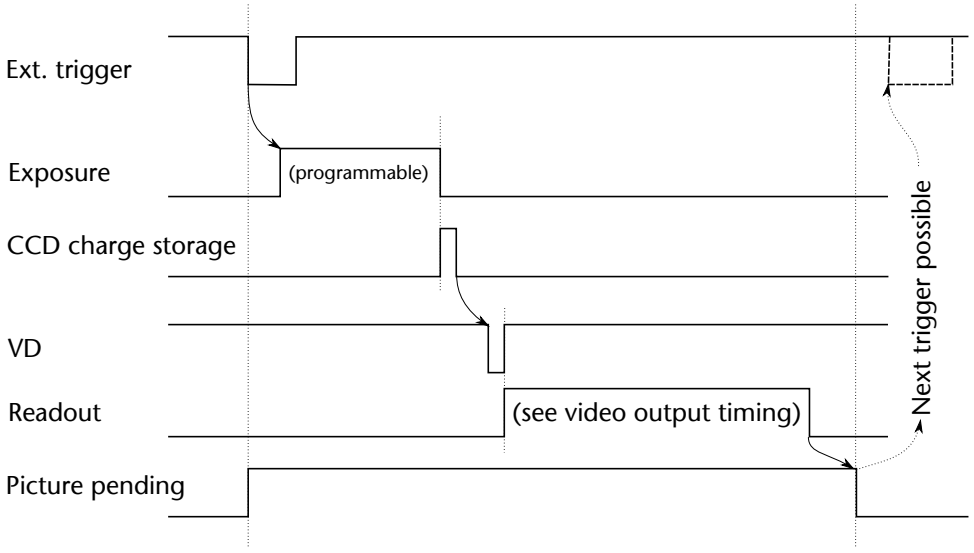

Figure 3.4. Edge preselect mode timing

3.2.4. Specific trigger modes of the CMOS rolling shutter cameras

The way how the pixel integration and readout is handled by rolling shutter cameras (see Section 3.1.3, “CMOS: global vs. rolling shutter” [p. 24]) is significantly different from cameras featuring global shutter. Thus also the trigger modes implemented by rolling shutter cameras are

different. See Appendix A, *Technical specifications for individual models* [p. 64] or the datasheet of every respective rolling shutter camera to learn which trigger modes it implements.

3.2.4.1. Snapshot mode

In the snapshot mode only the leading edge of the trigger pulse is significant. When encountered, first row of the sensor is reset and its exposure starts. With a small offset, the second row and gradually all other rows are reset and their exposure starts. When the last row is reset, a period when all row are exposing starts. The possible (recommended) strobe illumination should fall into this period. The length of the exposure is to be software programmed through the LV-SDS interface (Chapter 5, *Camera configuration* [p. 49]). When the common exposure time (strobe period) ends, first line is read out, then the second line and all other lines until entire sensor is read out.

The trigger should be delivered through one of the input lines of the Hirose 12–pin i/o connector (see Section 3.3.1, “Trigger input” [p. 28]). The trigger pulse duration should be at least 2 H, trigger overlapping is not supported. Exposure time (meaning the “strobe” period when all rows are integrating) can be programmed in a sensor specific range (see Appendix A, *Technical specifications for individual models* [p. 64]).

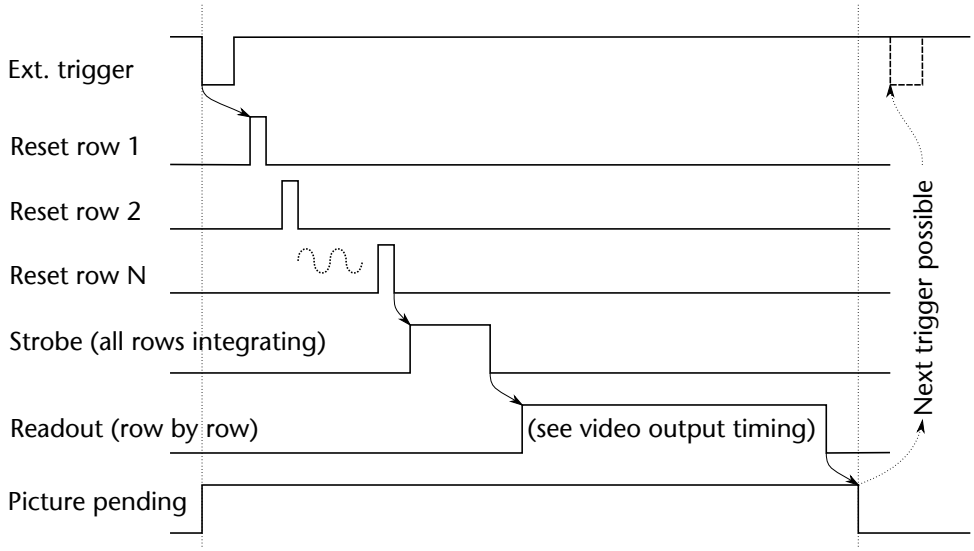

Figure 3.5. Snapshot mode timing

3.2.4.2. Global reset mode

The global reset mode is very similar to the snapshot mode (refer to Section 3.2.4.1, “Snapshot mode” [p. 27] for more details). The main difference is that all sensor rows are “globally” reset at the same time and the common integration time (strobe period) begins. After that, row-by-row sensor readout starts.

Because in global reset mode all the image rows are reset at the same time, but the readout is performed gradually, row-by-row, as usual for rolling shutter sensors, the exposure time is actually different for every image row (shortest for the first, longest for the last row). Thus it is highly recommended to use this mode only with a strobe illumination falling into the common exposure time period.

The main advantage over the snapshot mode is that the global reset mode is significantly faster (with the snapshot mode you loose one frame time between the actual trigger and start of the strobe period).

The trigger should be delivered through one of the input lines of the Hirose 12–pin i/o connector (see Section 3.3.1, “Trigger input” [p. 28]) — use optocoupler input #0 or #1, the **TTL trigger**

input should be left unconnected. The trigger pulse duration should be at least 2 H, trigger overlapping is not supported. Exposure time (meaning the "strobe" period when all rows are integrating) can be programmed in a sensor specific range (see Appendix A, *Technical specifications for individual models* [p. 64]).

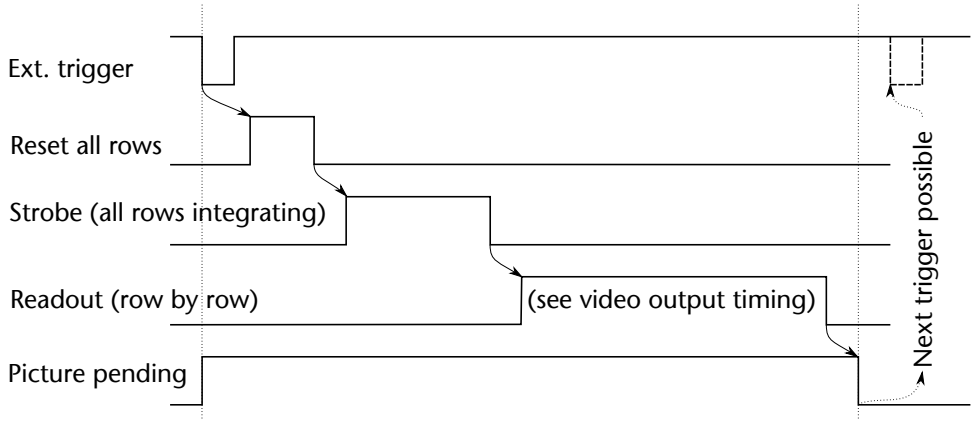

Figure 3.6. Global reset mode timing

3.3. Input and output signals

3.3.1. Trigger input

For triggering either the TTL trigger input or one of the optocoupler inputs can be used. There is a difference in the way the trigger is handled.

The TTL trigger line goes directly to the camera module and therefore the pulse width on the TTL input defines the exposure time (if the camera is set to the pulse width triggered mode). Note that the polarity of the TTL trigger cannot be configured by software; the trigger start is always the positive edge of the pulse on the TTL trigger input pin (regardless what polarity is set in the camera definition in Camera Editor and/or which polarity is configured in the advanced I/O configuration of Sequencer DRAL, Orchid or other software library).

The TTL trigger input (accessible on the Hirose connector, see Section 2.2, "Connector and cable description" [p. 15]) should be configured as GPIO TTL input #5 in LV-SDS. Note that GPIO TTL inputs #0–4 are not available on the outside connectors, they might only be made available for volume OEM customers.

The TTL trigger input should be left unconnected when using the "global reset trigger mode" of rolling shutter cameras (Section 3.2.4.2, "Global reset mode" [p. 27]). With this mode, only the optocoupler inputs are allowed for connecting external trigger.

The optocoupler inputs are not directly connected to the camera module. Therefore the pulse on the optocoupler generates internally an interrupt and the interrupt handler creates a TTL trigger with the length corresponding to the shutter time, which was pre-set by software. The interrupt is only raised upon a specific edge and thus the pulse width on the optocoupler input does not have any influence. Thus the trigger on the optocoupler input behaves like the edge preselect trigger mode, regardless of the trigger mode actually set. The expected polarity on the optocoupler inputs can be configured by software on the host side. See also Section 2.8, "The optocoupler interface" [p. 21].

Because the camera generates internally the direct TTL trigger if optocoupler is used for trigger input (see above), the TTL trigger input line must be left untouched in such case to prevent any conflicts.

To keep compatibility with other Leutron Vision hardware products, optocoupler input #0 is used by default as trigger input in LV-SDS libraries if not explicitly configured otherwise. If you wish to use the pulse width mode with direct pulse width control from the external pulse, you have to use the TTL trigger input and explicitly configure the trigger input as GPIO TTL input #5 in the LV-SDS I/O configuration.

3.3.2. Video output

PicSight®-GigE cameras output pixel data by means of standard Gigabit Ethernet interface, using a protocol compatible with the GigE Vision standard.

3.3.3. Other signals

Signals not directly related to video acquisition are described in other parts of this manual. Please refer to Section 2.6, “DC power input” [p. 20] for information about the power input signal. The RS-232 serial communication port (Section 2.2.2, “Power input connector” [p. 16]) is only accessible with the “smart” version of the cameras, PicSight®-Smart (Section 3.7, “PicSight®-Smart models” [p. 31]).

The optocoupler inputs and outputs can be configured and used for any user defined I/O in LV-SDS applications. More GPIO ports might be made available for volume OEMs on request.

3.4. Video format

3.4.1. Basic image properties

All the PicSight®-GigE and PicSight®-USB cameras provide up to 12–bit video output. The application may choose (through standard LV-SDS interface) to acquire only 8–bit data — the camera will be configured automatically by LV-SDS to send only 8–bit pixels over the bus.

The CMOS models provide only 10–bit effective data, which is shifted (and in the lowest to bits padded with zeroes) to provide 12–bit output.

Color version of the individual camera models use always the same sensor as the monochrome version, just equipped with a Bayer mosaic filter. Proper color interpolation algorithm has to be performed on the image to get proper color image. This interpolation (decoding) can be performed by LV-SDS libraries. Query Leutron Vision about possibilities to perform the decoding directly on the camera.

3.4.2. Bayer encoded cameras

In general, the Bayer mosaic filter can be positioned on top of the chip in four different ways. They are usually referred to using acronyms specifying the colors of the four (or just two) pixels in the top-left image corner. See Figure 3.7, “Bayer mosaic formats” [p. 30] illustrating the individual formats. Individual PicSight® cameras are equipped with sensors featuring different Bayer mosaic formats, refer to Appendix A, *Technical specifications for individual models* [p. 64] to learn which one applies. The possible format names are:

- BGGR (aka. BG) — the top left pixel is blue
- GBRG (aka. GB) — the top left pixel is green, followed by a blue one
- RGGB (aka. RG) — the top left pixel is red
- GRBG (aka. GR) — the top left pixel is green, followed by a red one

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Customers using the PicSight® cameras with LV-SDS do not need to bother with these details, however, the cameras are fully integrated in LV-SDS and proper format is automatically selected, no matter whether the decoding is performed by hardware or software means.

The Bayer array format can change when region of interest (ROI) is applied to the image. To avoid this issue, use always ROI offset of multiple of 2 pixels in both dimensions. Features like binning or decimation might completely destroy the color information in the Bayer encoded image.

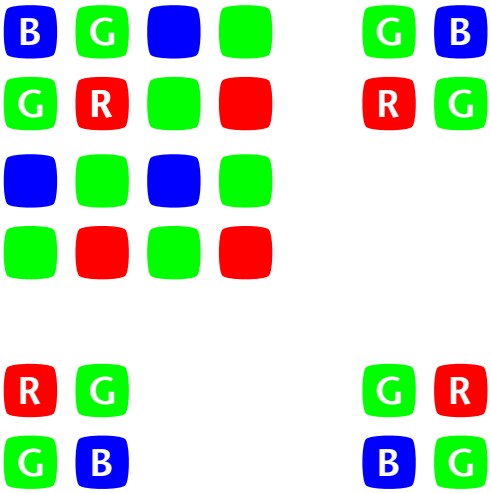

Figure 3.7. Bayer mosaic formats

3.5. Gain and black level

For optimal digitization, the PicSight® cameras support adjustment of

- analog gain — amplification applied by the A/D converter during the signal conversion
- digital gain — amplification applied to already digitized image by means of a bit-shift (by controlling which bits are actually output from the A/D convertor)
- black level (offset) — offset applied to the video signal, shifting the output values to desired range

The gain and black level can currently be set only by means of the raw sensor specific values (see Chapter 5, *Camera configuration* [p. 49]). We will soon add a uniform interface allowing to adjust gain and black level in sensor independent way.

In general, the CCD cameras support analog gain adjustment in range 6–42 dB (in 1024 steps) and black level adjustment in range 0–255. The CMOS cameras have currently no support for black level function and their support for analog or digital gain vary from model to model.

3.6. Using the “network filter driver”

Streaming video data over a network might lead to quite high network load. When the data has to be fully processed by the common network stack implemented by the operating system, the streaming bandwidth might be significantly degraded and high CPU load on the PC side might be involved. To solve these issues, Leutron Vision delivers a dedicated network filter driver.

The filter driver, when installed, hooks in a low-level point within the network stack and observes all the network communication going through the network card where it is installed. It filters out all the packets related to PicSight®-GigE streaming in an effective way and passes them directly to LV-SDS buffers. All other communication (not related to PicSight®-GigE) is passed up to higher

levers of the network stack, so that they can reach the expected target. The filter driver thus does break any other communication routed through the same network interface.

It does not replace the network card's driver, but rather allows to communicate with that driver directly than going through the standard network stack. The network stack overhead is thus fully eliminated for the PicSight®-GigE streaming.

The filter driver is independent on the network card model an it can be used with any Gigabit Ethernet equipment.

Using the filter driver might slightly decrease performance of other network traffic (not related to PicSight®-GigE cameras) routed over the network card on which the filter driver is applied. This involves configurations where the same network card is used for connecting the camera as well as for other network traffic at the same time (when the camera is connected over a switch). The performance impact is, however, not too high, typically just few percent.

See Section 4.3, “Installing network filter driver under Windows” [p. 40], providing information about installation and configuration of the filter driver.

3.7. PicSight®-Smart models

Every PicSight®-GigE camera also exists in the “smart” version (PicSight®-Smart). The basic functionality and Ethernet interface of the PicSight®-Smart cameras is identical to PicSight®-GigE cameras, but PicSight®-Smart models furthermore provide additional resources and functionality:

- 32-bit RISC processor
- additional RAM memory (64 MB or more), flash memory
- real-time operating system
- SDK including C/C++ compiler and libraries for image acquisition, camera control, communication facilities and more

This allows to perform conditioning of the acquired image or full image processing on the camera. Results of the processing can be signalled to the outside world through the i/o lines, over the serial RS-232 line or over the Ethernet interface.

Technical details about individual PicSight®-Smart cameras are listed in Appendix B, *Technical specifications for the “smart” models* [p. 85].

Complete description of the PicSight®-Smart cameras and especially their programming and configuration is described in dedicated documents: PicSight®-Smart manual and PicSight®-Smart reference.

4. Software installation

This section provides instructions how to install software for development with PicSight®-GigE cameras and what are the options to test the installation and individual camera features.

To get even more information about LV-SDS installation and configuration options, refer directly to the Installation and configuration guide.

4.1. GigE Vision & GenICam compatibility

The PicSight®-GigE cameras are fully GigE Vision and GenICam compatible (see Section 1.4.1, “GigE Vision & GenICam” [p. 9]).

Before you start installing any software, you should know how you want to use the camera. You have basically two options:

- Pure GigE Vision and GenICam interface — in this case you don't need to install any Leutron Vision software. The basic camera configuration could be done through the camera's integrated HTTP interface (see Section 5.3, “HTTP-based configuration” [p. 53]). The camera functionality can then be accessed from any GigE Vision (and GenICam) compliant application. Just remember, that the camera comes by default adjusted to use a fixed IP address (refer to Section 1.4.1, “GigE Vision & GenICam” [p. 9]), to use it in the GigE Vision compatible mode, the camera should be switched to the DHCP mode using the HTTP interface mentioned above.
- LV-SDS interface — in this case the camera would be accessed through the Leutron Vision libraries and tools. Carry on with the installation process as described below.

Both options have their own advantages. The first one gives you free choice of any third party GigE Vision compatible tool, as well as virtually unlimited choice of platform and programming language, depending on which tools are available on the market or which you implement yourself. The second one provides the comfortable, full featured set of libraries and tools, integrating all the Leutron Vision hardware products within a single API. It also offers a set of tools allowing to test the full camera functionality without writing any single line of code.

4.2. Installing LV-SDS under Windows

4.2.1. Running the setup program

There are two ways to run the installation program: from the installation CD-ROM or using the files downloaded from LV-SDS download page[1].

4.2.2. Installation CD-ROM

If you are installing the LV-SDS from the installation CD, just insert it to your CD-ROM drive, the setup program is started automatically (in case that no program is started, please run the `LvAuto.exe` application from the root directory of the CD).

The setup program's main window appears. The program checks the components present on the CD and displays a list of corresponding links in the window.

Clicking the Install LV-SDS link will start the installation procedure. Please follow the instructions described in the next chapters. LV-SDS, including all the necessary drivers, will be installed to your computer.

[1] http://www.leutron.com/download/lv_sds/lib.html

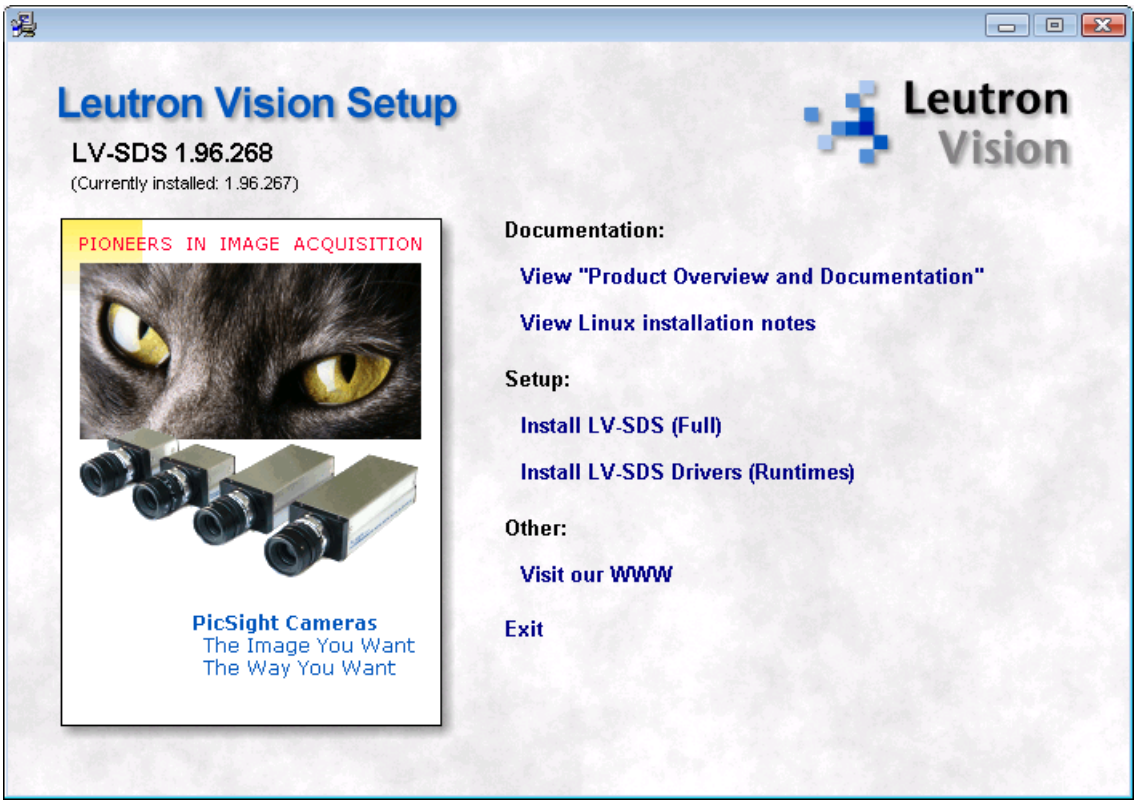

Figure 4.1. LV-SDS Setup program

4.2.3. Downloaded Files

To start the installation, just run the appropriate file downloaded from our LV-SDS download page[2], for example `lvsds200005.exe`. Please note that "200005" in the file name stands for LV-SDS version 2.00, build 258.

LV-SDS, including all the necessary drivers, will be installed to your computer.

The LV-SDS documentation (consisting of multiple manuals) is not included in the setup program described above. To install it together with LV-SDS, please download the required manuals from download area[3] on our web server as well and put it to the directory with the setup program before starting the installation process.

4.2.4. Installation process

The installation procedure is common for all supported versions of Windows operating system. Installation procedure described in this manual is shown on Windows Vista operating system. Some differences which are specifics for older version of Windows will be explained separately.

The LV-SDS setup program inspects your system and allows you to install the appropriate LV-SDS components. The installation procedure itself is described below:

After starting the installation, either from the installation CD-ROM or from the downloaded files, you will see two introduction windows informing you about the software you are going to install. Please click the Next button to proceed.

[2] http://www.leutron.com/download/lv_sds/lib.html
[3] http://www.leutron.com/download/index.htm

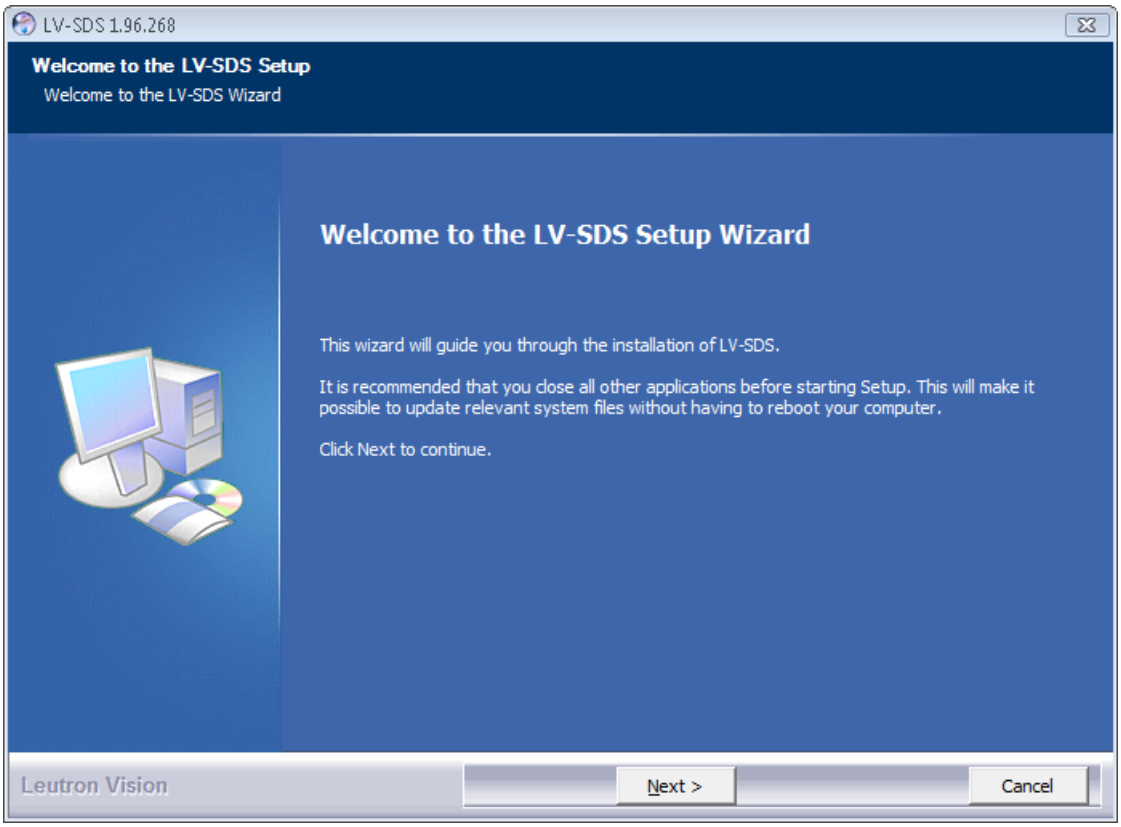
LV-SDS 1.96.268
Welcome to the LV-SDS Setup
Welcome to the LV-SDS Wizard
Welcome to the LV-SDS Setup Wizard
This wizard will guide you through the installation of LV-SDS.
It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.
Click Next to continue.
Leutron Vision
Next >
Cancel

Figure 4.2. LV-SDS installation, Welcome window

In the following window you can read terms of license agreement. Confirm to proceed to the next step of the installation which is the selection of the destination directory for LV-SDS files. The setup program inspects your system and if it finds an older version of LV-SDS, it offers this directory to be used as the destination location. If you are satisfied with the destination suggested by the setup program, just click Next to proceed. If you want to change it, please click the Browse button to specify your destination.

If you are going to develop and compile own applications, and if you use some older Windows compiler or other tools, it might be better not to have spaces in the path to the `lib` and `include` directories containing the library (`.lib`) and header (`.h`) files. In such case it is not recommended to install LV-SDS to `C:\Program Files\LVSDS...`, otherwise you would have to use short paths and names in your compiler settings. Please check documentation of your development tools to see if spaces and long file names might be a problem.

It is important to have in mind that Windows Vista in contrary to older versions of Windows operating systems consider `Program Files` and `Windows` directory as protected location. On these directories virtual files protection applies, which can cause some problems with read-write access. Thus the setup program allows you (only if you decide proceed installation to `Program Files` directory) to choose different location for storing configuration files .

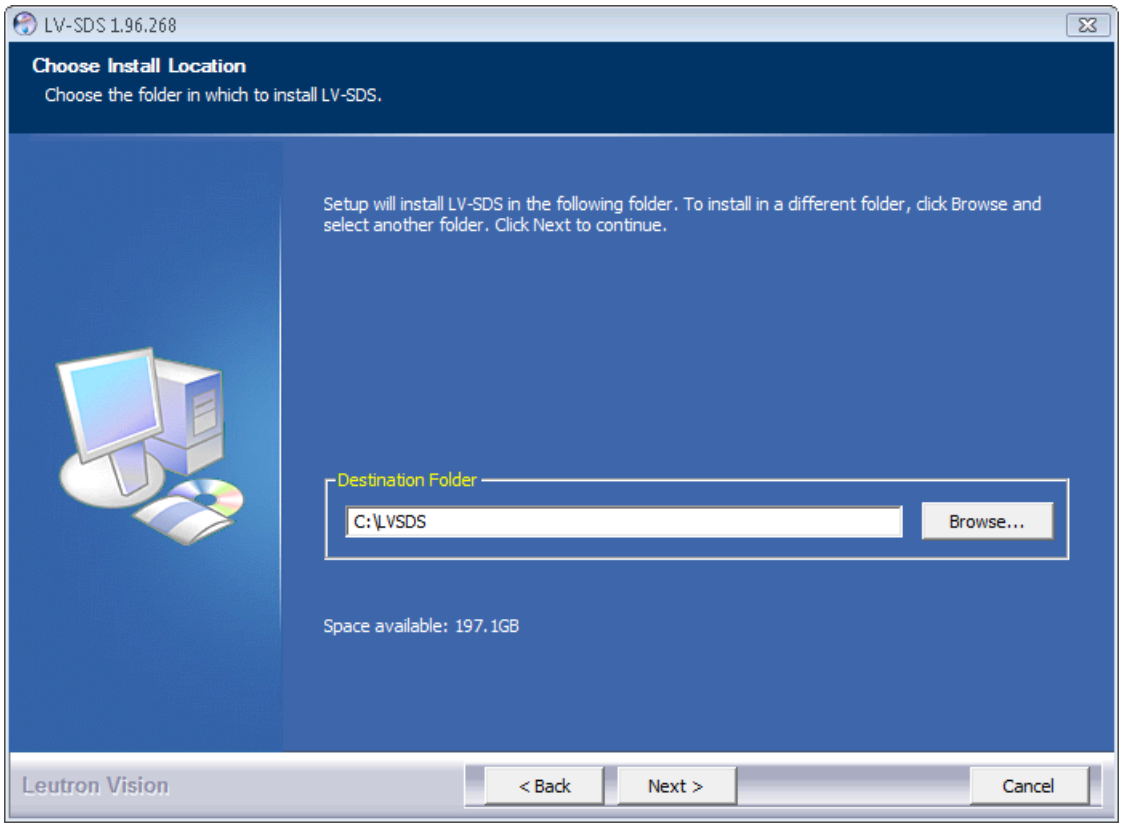
LV-SDS 1.96.268
Choose Install Location
Choose the folder in which to install LV-SDS.
Setup will install LV-SDS in the following folder. To install in a different folder, click Browse and select another folder. Click Next to continue.
Destination Folder
C:\LVSDS
Browse...
Space available: 197.1GB
Leutron Vision
< Back
Next >
Cancel

Figure 4.3. LV-SDS Installation location

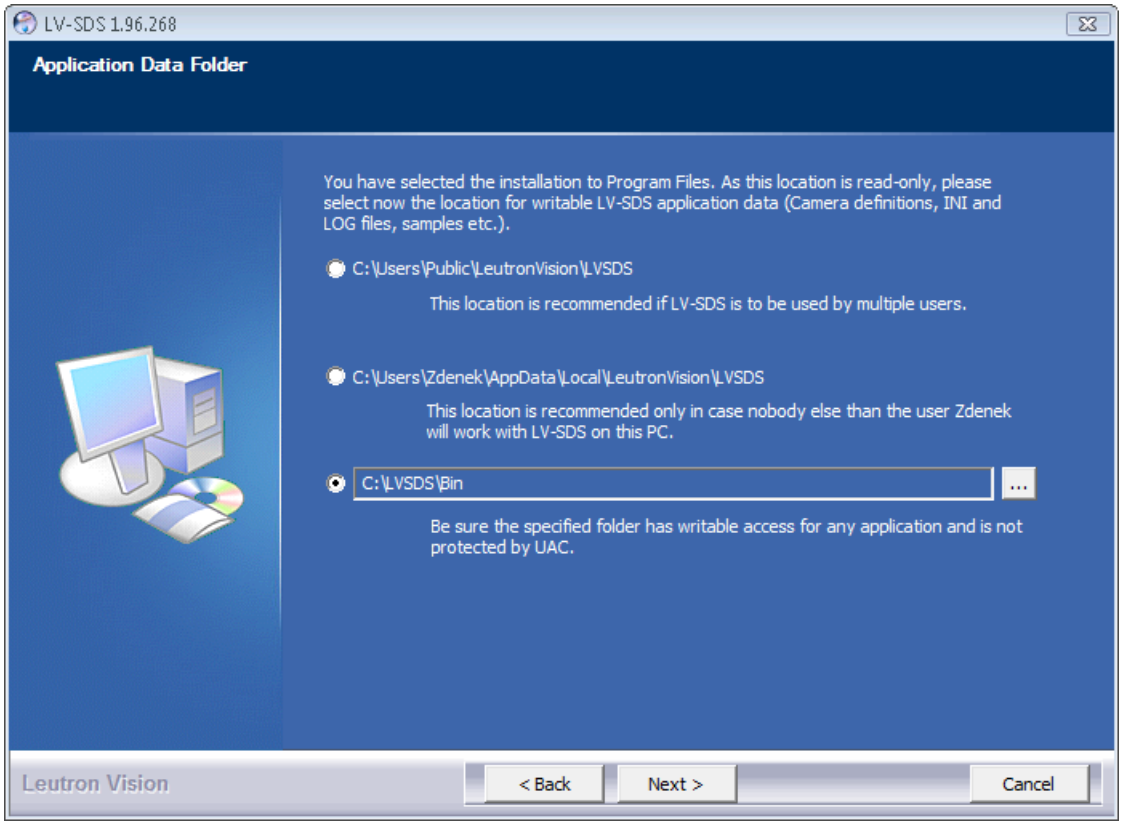
LV-SDS 1.96.268
Application Data Folder
You have selected the installation to Program Files. As this location is read-only, please select now the location for writable LV-SDS application data (Camera definitions, INI and LOG files, samples etc.).
C:\Users\Public\LeutronVision\LVSDS
This location is recommended if LV-SDS is to be used by multiple users.
C:\Users\Zdenek\AppData\Local\LeutronVision\LVSDS
This location is recommended only in case nobody else than the user Zdenek will work with LV-SDS on this PC.
C:\LVSDS\Bin
...
Be sure the specified folder has writable access for any application and is not protected by UAC.
Leutron Vision
< Back
Next >
Cancel

Figure 4.4. LV-SDS installation, Application data folder

After selecting the destination directory, you may choose the components that should be included in your installation. Please select the desired options and click the Next button. If some of the components may not be installed (eg. because the component is not available for your operating system), the option will be disabled (grayed).

The setup program looks for the documentation files stored in `the Doc` directory, so if you want include the documentation into the installation process, please copy the `Doc` directory the into setup program directory.

The LV-SDS supports both the frame grabbers and PicSight® "bus" cameras (with GigE Vision and USB interfaces). In case you are using only one of these devices, you can disable the others. In case you disable the frame grabbers, the library will not search for frame grabbers through the startup. In case you disable PicSight®-GigE cameras, the library will not search on the network subnet for connected cameras, which can significantly speed up the startup. Note that these options influence only the `leutron.ini` file, so if you need to change them later on, there is no need to reinstall LV-SDS. Instead you can use the QuickSettings.exe program to modify the settings.

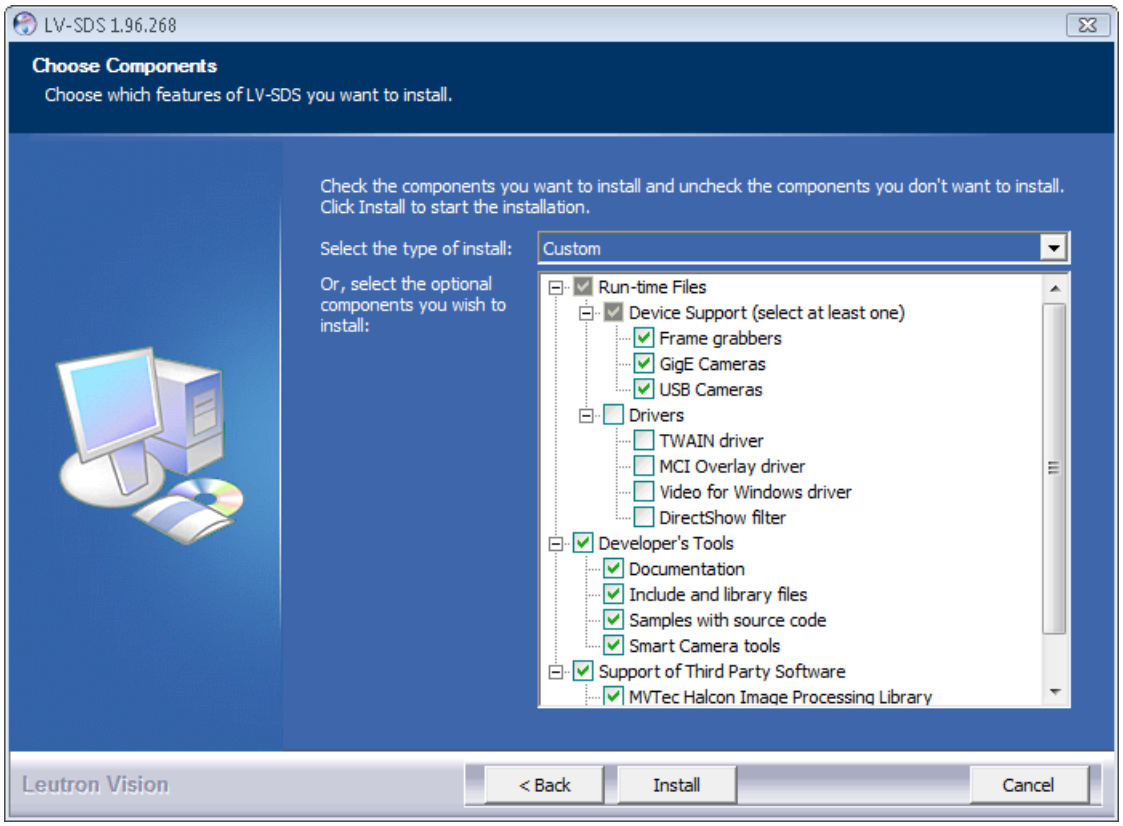

Figure 4.5. LV-SDS installation, selecting the device support and components

When you choose all the required components please click on the Install button to proceed rest of installation.

LV-SDS needs some additional components to run properly. It is the NET Framework 2.0™ or higher and Microsoft Visual C++ 2005 Redistributable™. If these component's are not installed yet, setup makes offer to install additional software from CD-ROM or runs an internet browser with an appropriate download link.

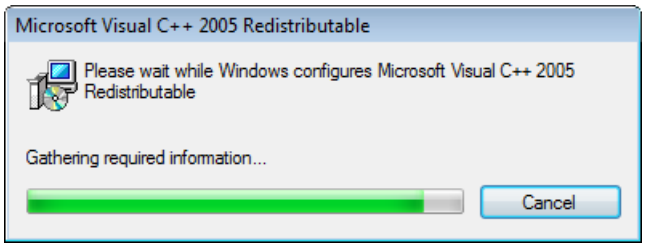
Microsoft Visual C++ 2005 Redistributable
Please wait while Windows configures Microsoft Visual C++ 2005 Redistributable
Gathering required information...
Cancel

Figure 4.6. LV-SDS installation, automatic installation of additional components from the setup program

In Windows Vista and latter, as the next step of installation is activated the device driver installation wizard. Please click on it's Next button to proceed. After the successful installation you can see a list of installed drivers. Let's click on Finish button to go on.

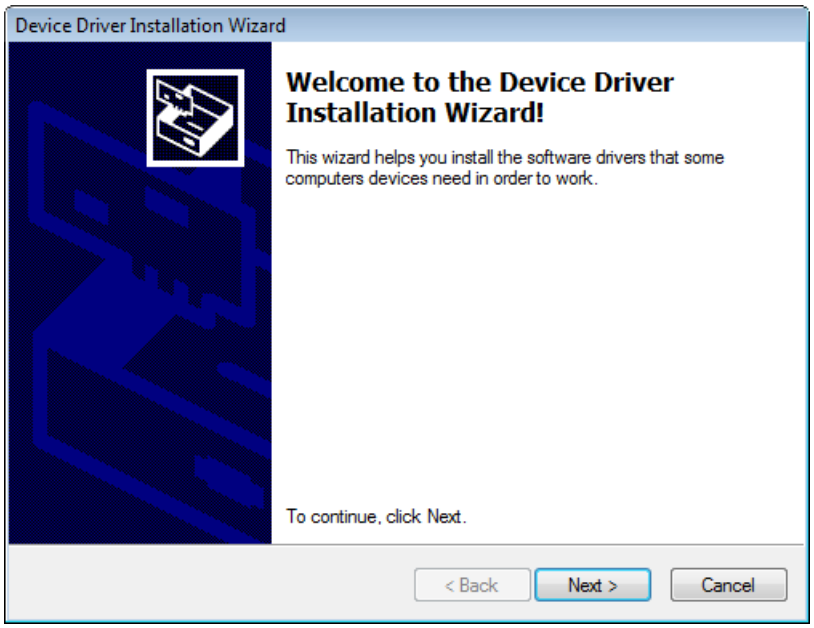
Device Driver Installation Wizard
Welcome to the Device Driver Installation Wizard!
This wizard helps you install the software drivers that some computers devices need in order to work.
To continue, click Next.
< Back
Next >
Cancel

Figure 4.7. LV-SDS installation, driver installation start

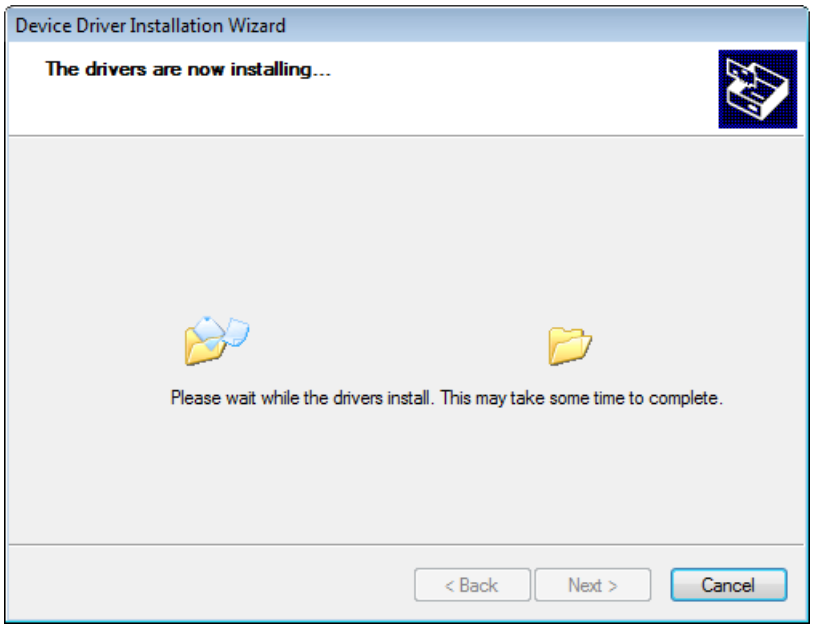
Device Driver Installation Wizard
The drivers are now installing...
Please wait while the drivers install. This may take some time to complete.
< Back
Next >
Cancel

Figure 4.8. LV-SDS installation, driver installation in progress

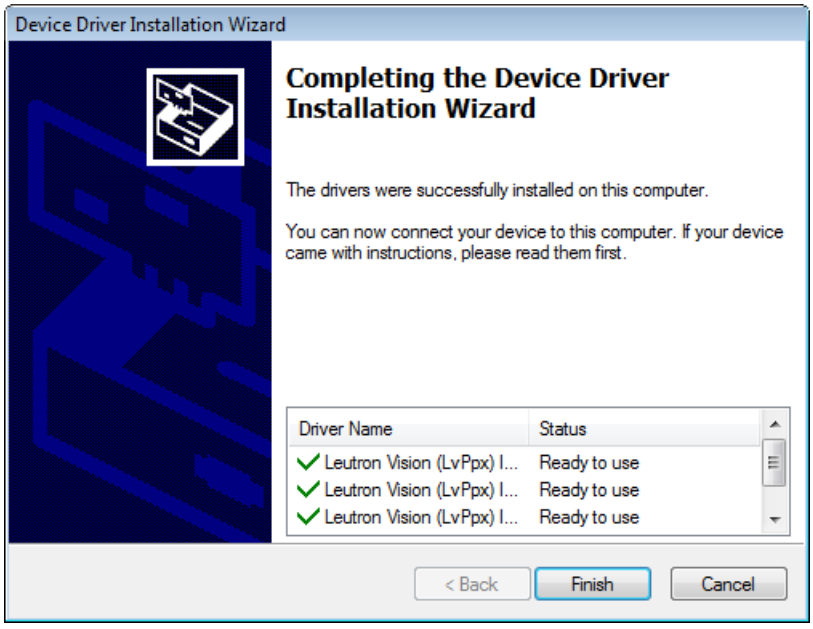
Device Driver Installation Wizard
Completing the Device Driver Installation Wizard
The drivers were successfully installed on this computer.
You can now connect your device to this computer. If your device came with instructions, please read them first.
Driver Name
Status
Leutron Vision (LvPpx) I...
Ready to use
Leutron Vision (LvPpx) I...
Ready to use
Leutron Vision (LvPpx) I...
Ready to use
< Back
Finish
Cancel

Figure 4.9. LV-SDS installation, driver installation finished

After copying all the files to your system, the installation is completed. Please choose Reboot now and click on Finish button. After restarting, LV-SDS is ready to use.

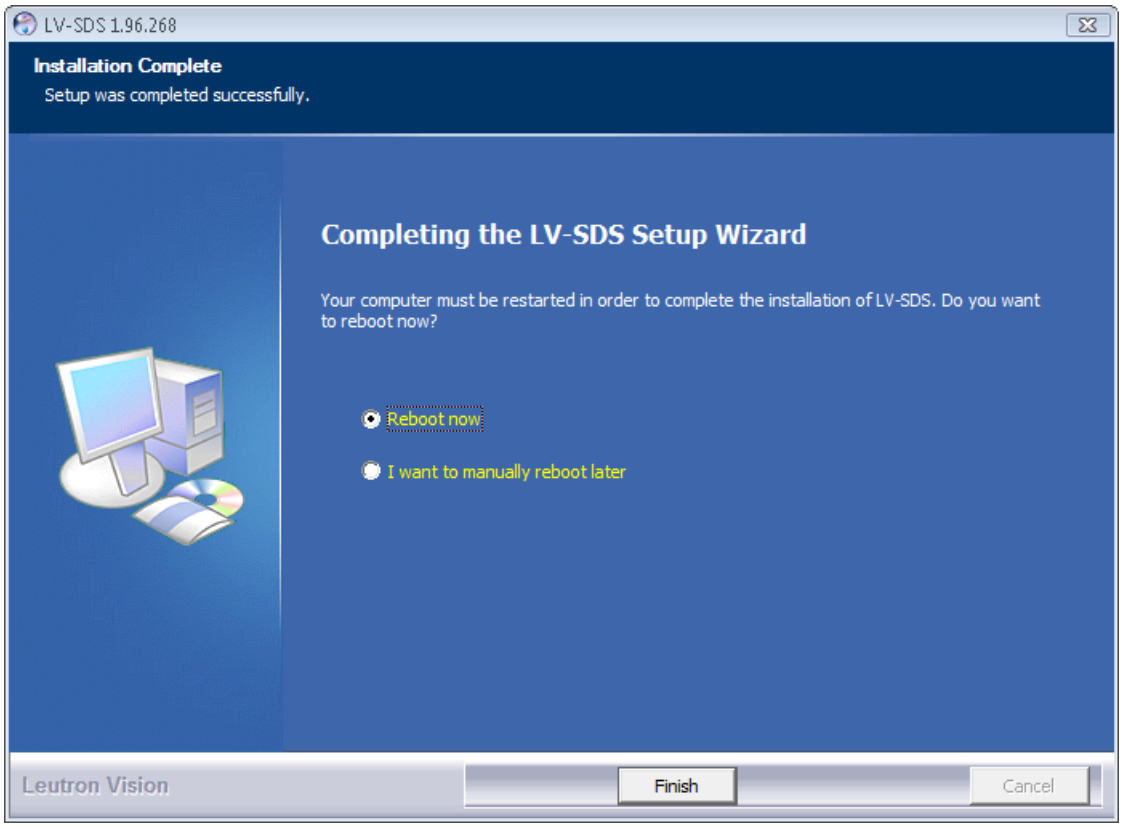
LV-SDS 1.96.268
Installation Complete
Setup was completed successfully.
Completing the LV-SDS Setup Wizard
Your computer must be restarted in order to complete the installation of LV-SDS. Do you want to reboot now?
Reboot now
I want to manually reboot later
Leutron Vision
Finish
Cancel

Figure 4.10. LV-SDS installation, installation completed

4.2.5. Installation results

A new Leutron Vision menu is added to the Start → Programs menu in Windows. It contains shortcuts for the Camera Editor application, for the LV-SDS documentation, as well as for several compiled sample programs.

In the location, specified during installation (default is `C:\`), the folder structure with LV-SDS files is created. The main folder is named LV-SDS.

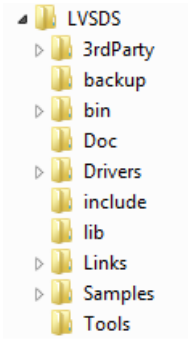

Figure 4.11. Folder structure in Windows

Under the destination folder the LV-SDS setup program creates the

- `3rdParty` folder: supporting software for use of 3rd party vision tools with our hardware (eg. Halcon/ActivVisionTools of MVTec Software GmbH, NeuroCheck of NeuroCheck GmbH).

- `Backup` folder: when you install a new version of LV-SDS, original files which could be modified by the user are copied there before they are overwritten by the new installation. Typically it is the `leutron.ini` file or `PP_Demo_CommCtl.ini` file.
- `Bin` folder, containing DLLs, executables (Camera Editor, sample and demo programs) and various data files belonging to Daisy/Orchid and other libraries (camera definition files, real time application libraries, configuration files etc.).
- `Doc` folder, optionally containing documentation to LV-SDS.
- `Drivers` folder, including setup programs of kernel drivers.
- `Include` folder, containing header files for Daisy, Orchid and other libraries.
- `Lib` folder, containing import libraries for the Daisy, Orchid and other DLLs in versions for Borland C++ and Microsoft Visual C++.
- `Links` folder, containing links to installed programs (can be used when installing to Start menu is disabled).
- `Samples` folder, containing special versions of some DLL's..
- `Tools` folder, containing `lvddw.dll` and `clserLTV.dll`.

The kernel device drivers are updated with the new installation of LV-SDS.

4.3. Installing network filter driver under Windows

To use the PicSight®-GigE cameras with Leutron Vision filter driver, follow the installation instructions listed below. Before doing that, you might want to learn more information about the filter driver [p. 30]. Note that the instructions below assume that LV-SDS is already successfully installed in the system.

Open the `Network Connections` applet in the Control Panel.

Windows Vista — menu Start → Control Panel → Network and sharing center → Manage Network Connection

Windows XP — menu Start → Settings → Control Panel → Network Connections

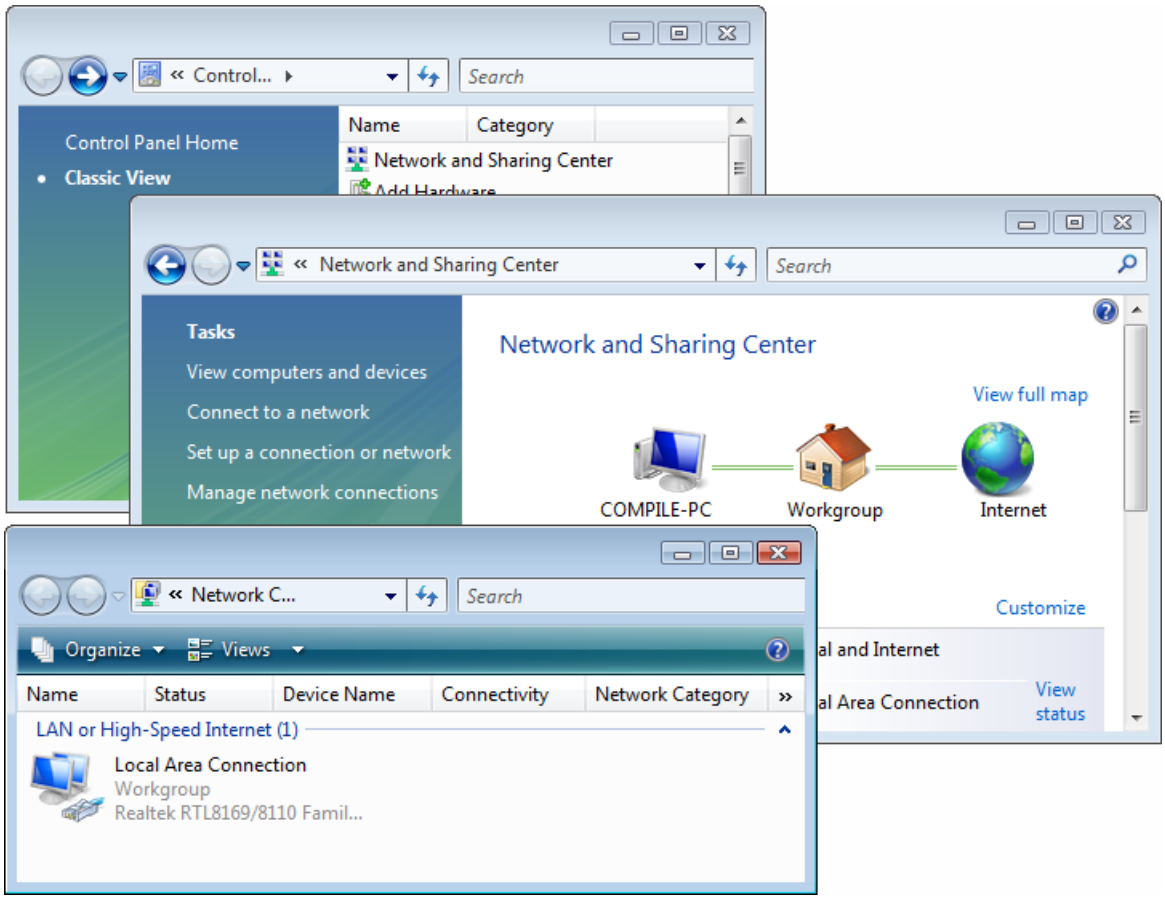

Figure 4.12. Windows Vista, Installing the network filter driver, step 1

Click with the right mouse button on the network connection, which is used to connect the PicSight®-GigE cameras, select Properties from the context menu.

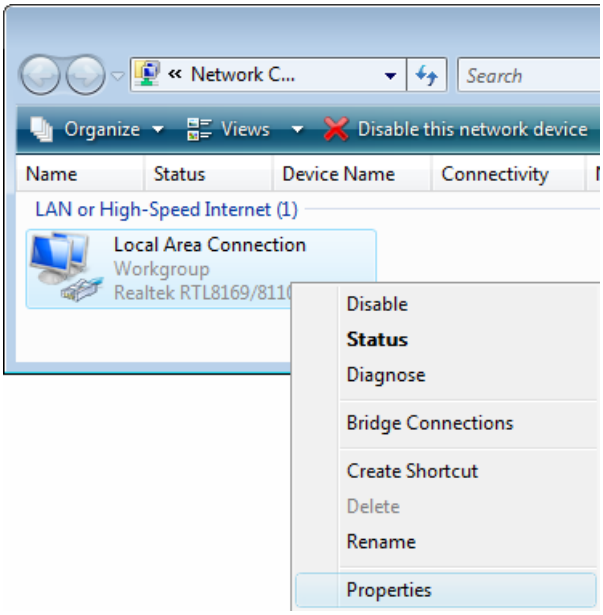

Figure 4.13. Windows Vista, Installing the network filter driver, step 2

In the Properties dialog box, General tab select Install... button to start the installation.

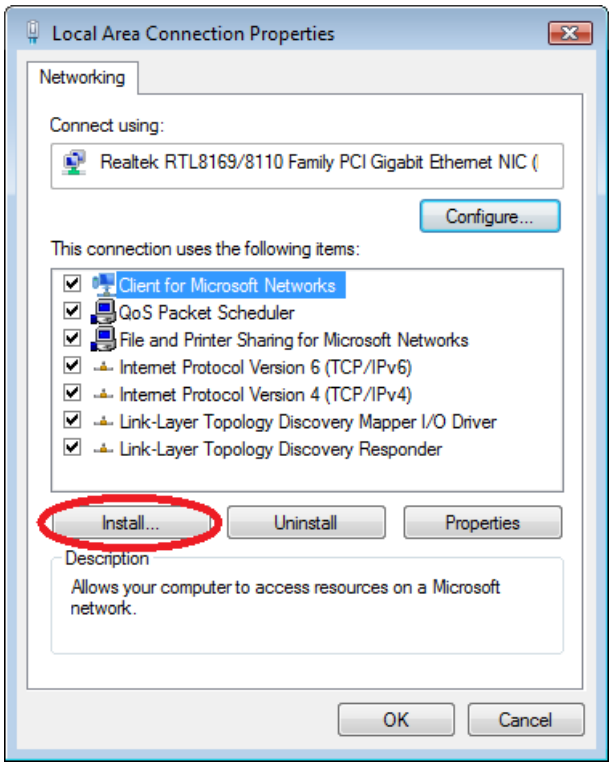

Figure 4.14. Windows Vista, Installing the network filter driver, step 3

The Select Network Component Type dialog box appear. Select Service as the new network component type and click the Add... button.

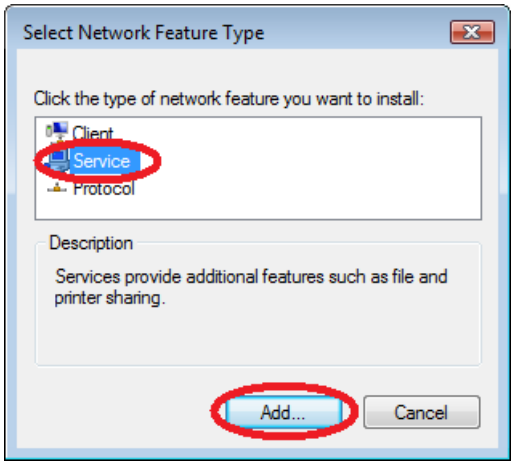

Figure 4.15. Windows Vista, Installing the network filter driver, step 4

In the Select Network Service dialog box ignore the options possibly offered by the system and click the Have Disk... button to specify the driver location.

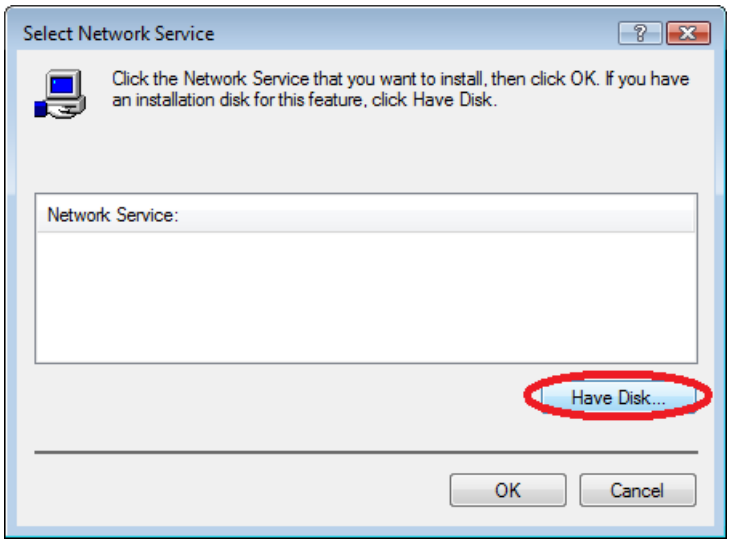
Select Network Service
Click the Network Service that you want to install, then click OK. If you have an installation disk for this feature, click Have Disk.
Network Service:
Have Disk...
OK
Cancel

Figure 4.16. Windows Vista, Installing network filter driver, step 5

In the next dialog browse to the location where the filter driver files are stored. The directory is *LVSDSHOME*`\drivers\Win_2000_XP`, where *LVSDSHOME* is LV-SDS installation directory, `C:\LVSDS` by default. When located,click Next.

For 64-bit Windows the driver files are located in *LVSDSHOME*`\drivers\WinXP_AMD64`.

The driver consists of 4 files that should in any case be available to the system in the same directory (that you need to locate in the dialog as described above). The files are: `lvgvpdrv.sys` *(the driver executable itself), the* `lvgvpdrv.inf` *(the file used to install/uninstall the driver), the* `lvgvpdrv_m.inf` *(auxiliary) and the* `lvdrv.cat` *with a digital signature.*

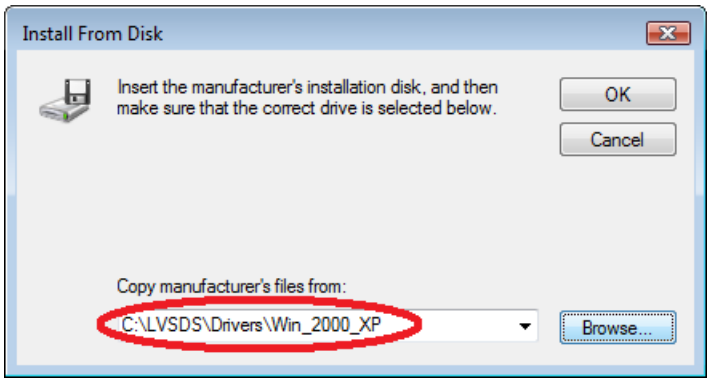

Figure 4.17. Windows Vista, Installing network filter driver, step 6

Windows should successfully find the proper driver and offer it for installation as “Leutron Vision Filter Driver”. Select that option and click the OK button. Depending on LV-SDS and Windows versions used one or more dialogs might appear to inform you that the driver is not tested for Windows compatibility. In such case, just click through them, allowing to finish the installation successfully.

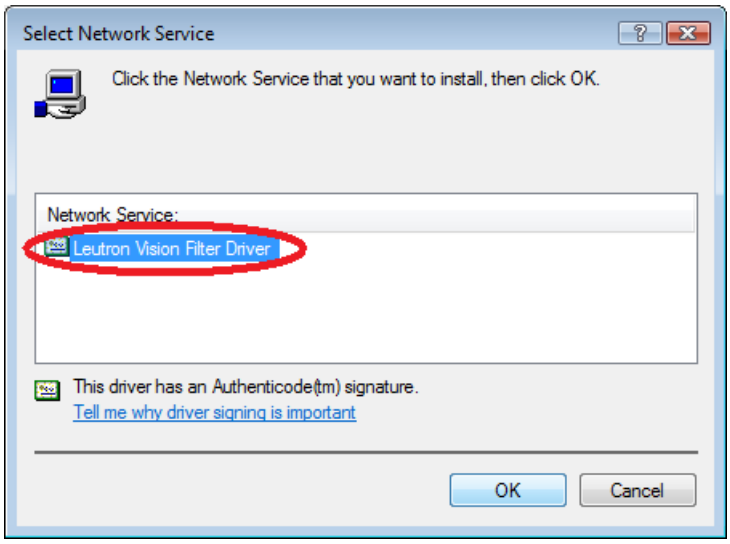
Select Network Service
Click the Network Service that you want to install, then click OK.
Network Service:
Leutron Vision Filter Driver
This driver has an Authenticode(tm) signature.
Tell me why driver signing is important
OK
Cancel

Figure 4.18. Windows Vista, Installing network filter driver, step 7

When finished the filter driver will be successfully installed and ready to use. You should see it listed in the Local Area Connection properties dialog box.

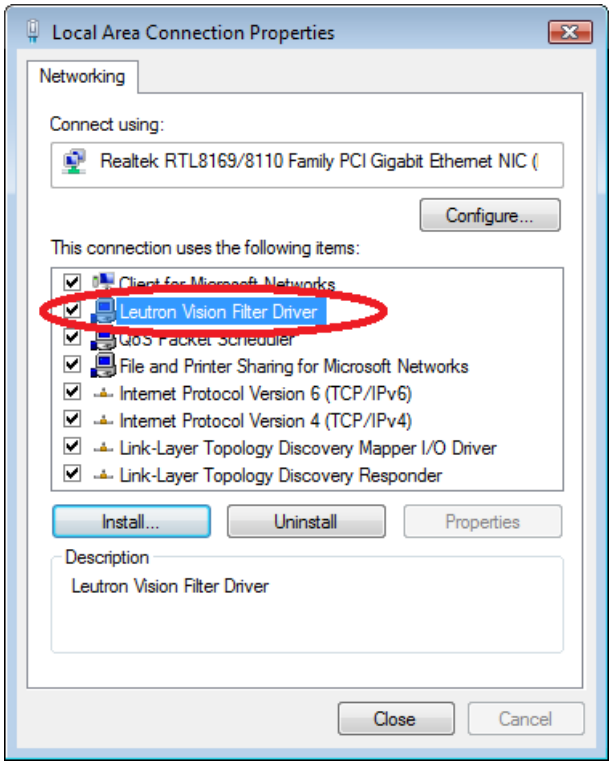

Figure 4.19. Windows Vista, Installing network filter driver, step 8

Configuration options related to the LV-SDS network filter driver (including enabling/disabling it) as well as other PicSight®-GigE related options are listed in the corresponding section of Installation and configuration guide.

4.4. Testing the installation under Windows

Make sure that the Leutron Vision hardware you plan to use for verification is installed and all the cameras are connected with the appropriate cables, properly powered and adjusted in proper

working mode (consult camera manuals if you need more advice). Check the “Getting started” document(s) for your hardware products (frame grabbers and cameras) to see more details about using each product whenever needed. The links to the individual manuals can be found in the “Main” document (entry point) of Leutron Vision documentation.

Now you can test the installation using one of the demo programs delivered with the installation. The general purpose UNIdemo program is to test any Leutron Vision hardware. For testing our PicSight®-GigE cameras, the dedicated PicSight® demo program can be even better suited. We will use UNIdemo program for the description below.

Start the UNIdemo program from the Start → Programs → Leutron Vision menu. The UNIdemo main control window appears.

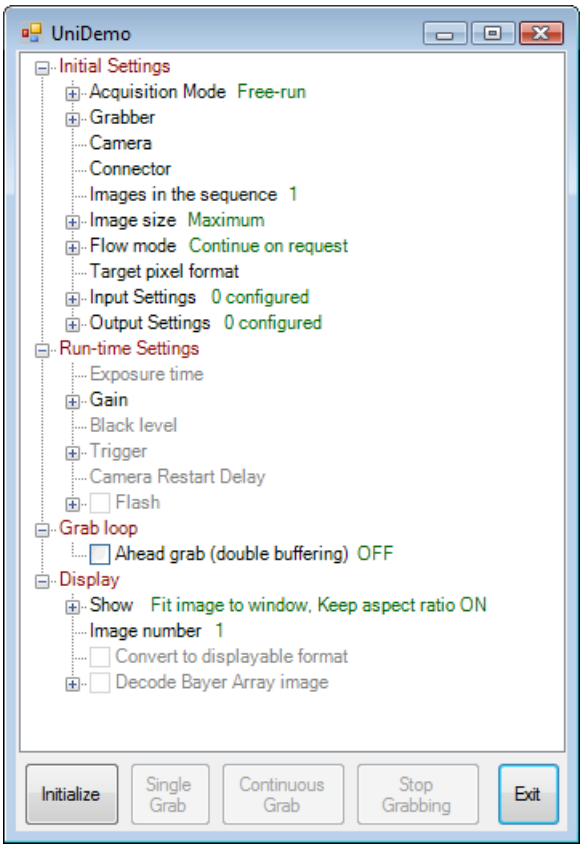

Figure 4.20. UNIdemo, main window

In the main window, click on Grabber option to select appropriate source of image acquisition. If all LV-SDS software and Leutron Vision hardware are installed correctly, you can select connected devices directly from initial Settings → Grabber submenu of UNIdemo program. Grabber submenu displays all devices possible to be used.

The devices listed in the Grabber listbox are not just physical frame grabbers, but rather logical grabbers as viewed by LV-SDS. Every “bus” camera (eg. a PicSight®-GigE camera) is listed here as well. LV-SDS libraries documentation provides more information about the device selection.

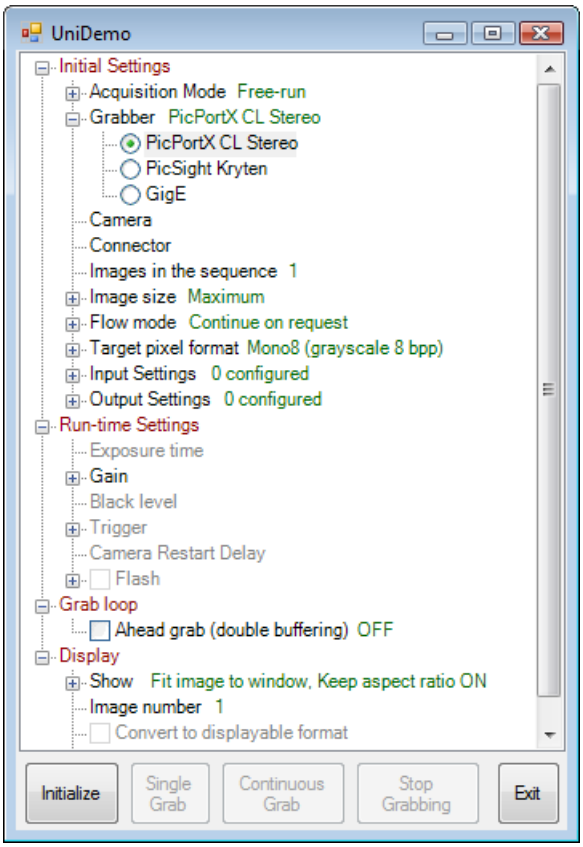

Figure 4.21. UNIdemo program, select the grabber

While on PicSight®-USB and PicSight®-GigE cameras it is enough to select it as the grabber, for frame grabbers and generic "GigE" and "USB" grabbers it is necessary to select the appropriate camera. Please click on Initial Settings → Camera submenu a select your camera.

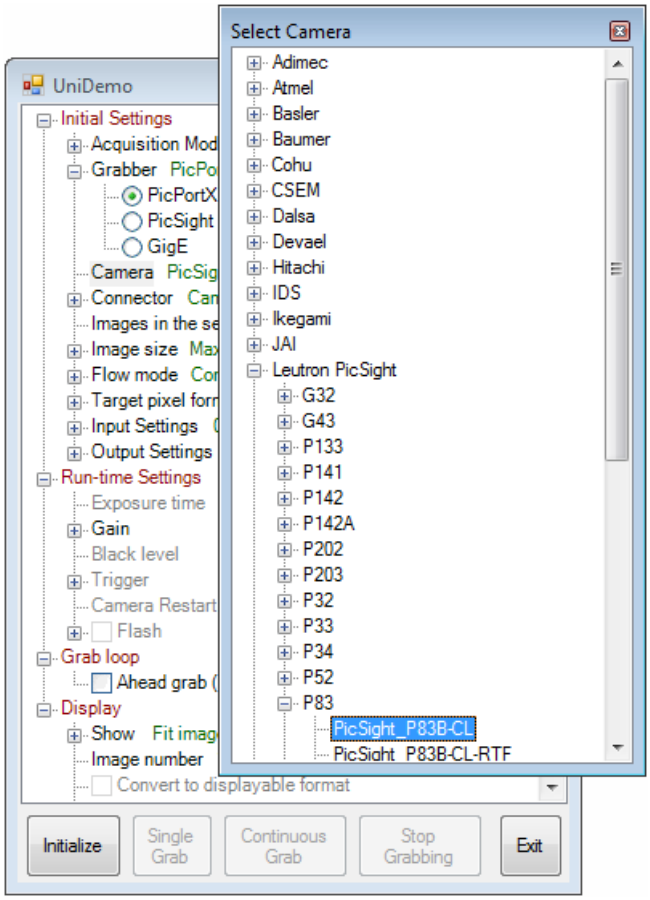

Figure 4.22. UNIdemo select camera device

Now is all prepared to test image transfer. First is necessary to initialize camera by pressing the Initialize button. If no error arises, so the device is preparing for image acquisition which can be started by pressing the Continuous Grab or the Single Grab button.

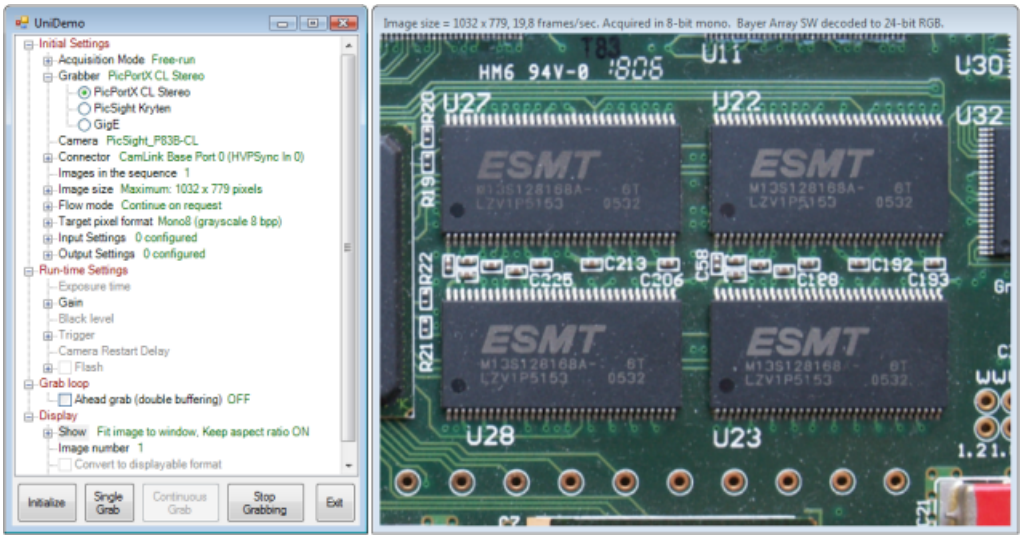

Figure 4.23. UNIdemo, live image

If you get an unexpected image, no image or an error message such as the one shown on the figure below, verify that the grabber/camera/connector selection you made really corresponds with your hardware, that the camera is properly connected, powered and configured (it should

be set in free running mode for this test). If you still have problems, please check documentation of all the hardware components you are using to see if everything is connected properly.

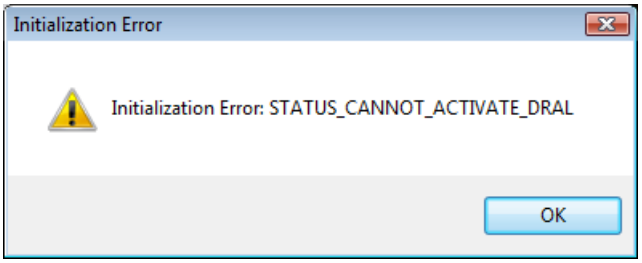

Figure 4.24. UNIdemo, error message

4.5. PicSight® demo

LV-SDS package contains a dedicated tool for testing PicSight®-GigE and PicSight®-USB cameras and most of their features, PicSight® demo. The tool is intuitive, easy to use and allows to verify easily the camera functionality and play around with camera features. Its user interface is briefly described in PicSight® demo manual.

5. Camera configuration

5.1. Possible impact of a firewall

If the host PC has a firewall software running and you experience troubles with the connection or data transfer, the firewall should be the first thing to check.

The firewall is a software which filters packets coming from the network and thus it can block some of the communication channels used by PicSight®-GigE. So it can happen, for example, that although the `ping` command succeeds, the PicSight®-GigE is not accessible via the HTTP protocol (the firewall has disabled access to machines on local network for web browsers). Similarly, it can happen that you can access PicSight®-GigE through HTTP, but when using the PicSight® demo, the images are not grabbed — this can happen when the firewall blocks the data sent from the camera through the UDP protocol.

Note also that the usage of the firewall software adds some CPU overhead which might degrade the throughput of the LAN.

The easiest attitude is to switch the firewall fully off. However, this can be recommended only for debugging or in situations, when the PC is not vulnerable to network attacks (for example, if you use the PC's network interface only to connect the camera). If the PC is connected to a network and especially to the internet, switching the firewall off is not a good idea; you should rather configure the firewall so that it remains active, but enables the communication with PicSight®-GigE.

5.1.1. Configuration of Windows XP Firewall

The example shown in this chapter describes the configuration of the Windows Firewall that is by default installed on Windows XP SP2. The situation is similar with firewalls delivered with other flavors of Windows.

If you need to keep the firewall switched on, you have to configure it in a way that it does not block the communication with PicSight®-GigE camera. In Windows Firewall this is done using “exceptions”(any incoming connections are prohibited, except those defined by the exceptions). To configure it, start the Windows Firewall applet in the menu Start → Settings → Control Panel.

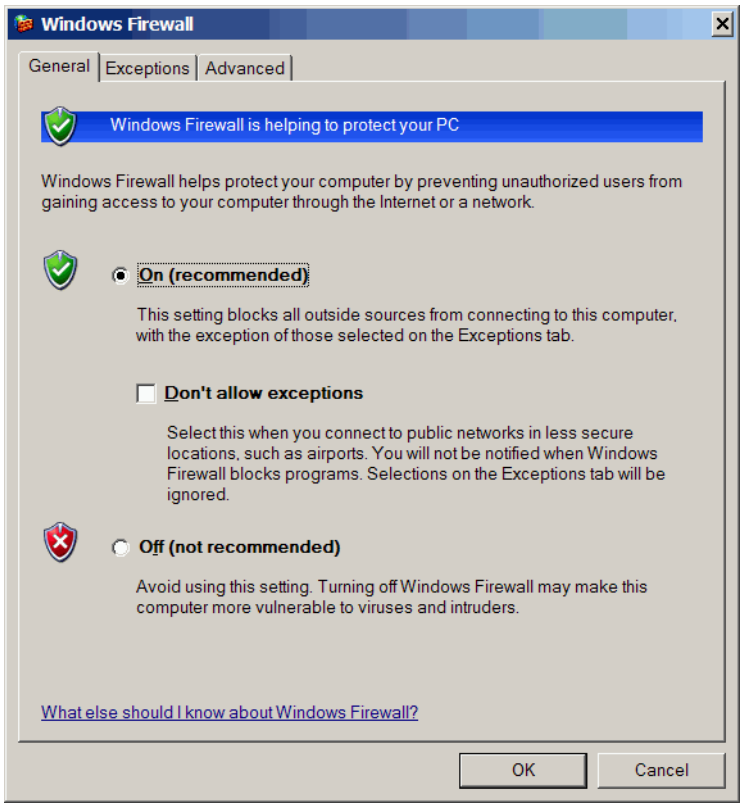
Windows Firewall
General
Exceptions
Advanced
Windows Firewall is helping to protect your PC
Windows Firewall helps protect your computer by preventing unauthorized users from gaining access to your computer through the Internet or a network.
On (recommended)
This setting blocks all outside sources from connecting to this computer, with the exception of those selected on the Exceptions tab.
Don't allow exceptions
Select this when you connect to public networks in less secure locations, such as airports. You will not be notified when Windows Firewall blocks programs. Selections on the Exceptions tab will be ignored.
Off (not recommended)
Avoid using this setting. Turning off Windows Firewall may make this computer more vulnerable to viruses and intruders.
What else should I know about Windows Firewall?
OK
Cancel

Figure 5.1. Windows Firewall, general settings

Make sure the Don't allow exceptions checkbox is not checked and switch to the Exceptions tab.

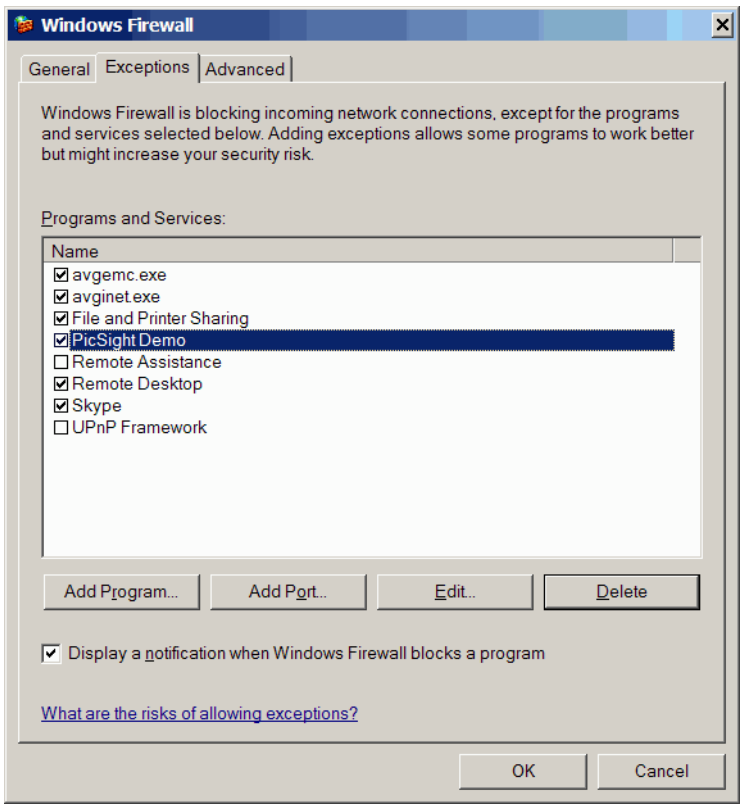

Figure 5.2. Windows Firewall, exception settings

Click Add Program... button and locate the PicSight® demo program. Then click OK to add the PicSight® demo in the exceptions' list. Since now incoming communication will not be blocked for PicSight® demo. Repeat the same procedure for any other executables (including programs you compile yourself) you want to use for acquisition from the PicSight®-GigE camera.

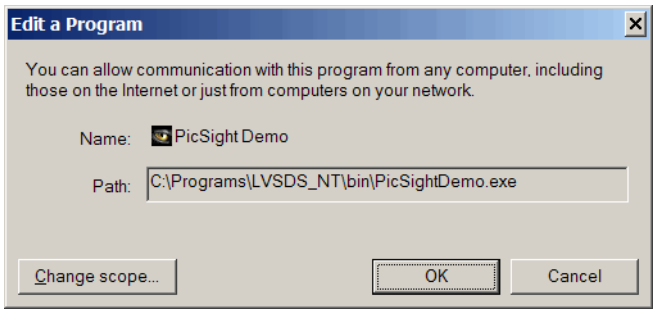
Edit a Program
You can allow communication with this program from any computer, including those on the Internet or just from computers on your network.
Name: PicSight Demo
Path: C:\Programs\LVSDS_NT\bin\PicSightDemo.exe
Change scope...
OK
Cancel

Figure 5.3. Windows Firewall, adding an exception

For adding the PicPort® and PicProdigy® demo program to the list, the `bin\PPDemo.dll` *should be stated, not the* `PPDemo.exe`.

If you like to be more secure, you can restrict this exception to the subnet only or even to a specific list of IP addresses (corresponding with IP addresses of your PicSight®-GigE cameras). Proper dialog for this configuration will appear after clicking the Change scope... button.

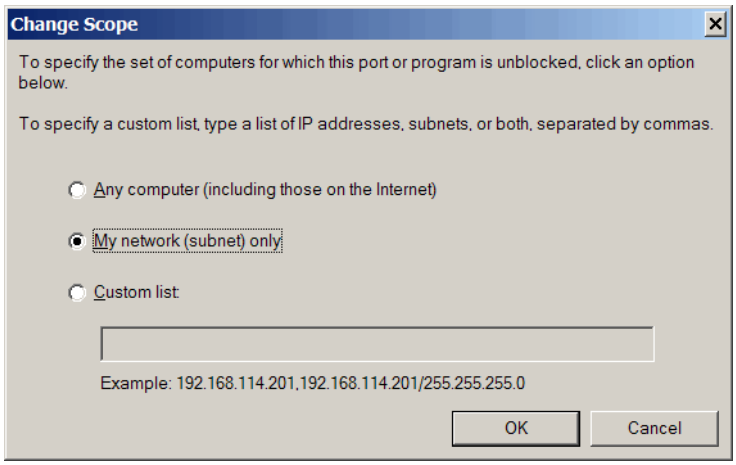
Change Scope
To specify the set of computers for which this port or program is unblocked, click an option below.
To specify a custom list, type a list of IP addresses, subnets, or both, separated by commas.
Any computer (including those on the Internet)
My network (subnet) only
Custom list:
Example: 192.168.114.201,192.168.114.201/255.255.255.0
OK
Cancel

Figure 5.4. Windows Firewall, changing scope for an exception

5.1.2. Configuration of other firewalls

If your system uses any other firewall, its configuration should be very similar to the XP one, depending on its design philosophy.

If you have a firewall that allows more detailed configuration, for example configuring also outgoing connections, make sure that no restrictions are made for outgoing HTTP connections (so that you are able to configure the PicSight®-GigE camera using your web browser), for `ping`, and in case you will need to access PicSight®-GigE over FTP, than make sure also that no restrictions apply for outgoing FTP.

5.2. Checking the connection

The PicSight®-GigE camera default IP address is `192.168.1.55`.

First check the connection using the `ping` command on the Command Prompt (menu Start → Run, type `cmd` and press OK, in the Command Prompt window type `ping 192.168.1.55` and press **Enter**).

A usual problem of an unreachable address can occur, depending on the configuration of your network:

```
C:\>ping 192.168.1.55

Pinging 192.168.1.55 with 32 bytes of data:

Reply from 213.246.64.229: Destination net unreachable.
Reply from 213.246.64.229: Destination net unreachable.
Reply from 213.246.64.229: Destination net unreachable.
Reply from 213.246.64.229: Destination net unreachable.

Ping statistics for 192.168.1.55:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

In such case it is necessary to temporarily change the settings of your network, in Start → Settings → Control Panel → Network Connections → Local Area Connection → Properties → Internet Protocol (TCP/IP) → Properties:

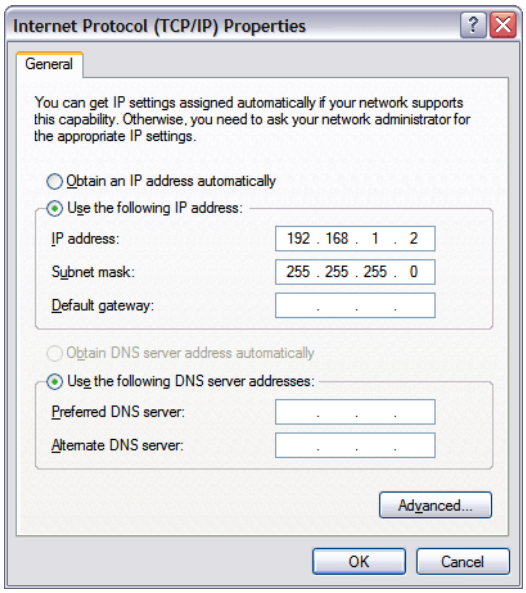
Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
192 . 168 . 1 . 2
Subnet mask:
255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

Figure 5.5. Setting network IP properties

Specify the subnet mask: it typically looks like: `255.255.255.0`. Such a mask means that the first three numbers in the IP address must be identical for the whole subnetwork, and the fourth number is arbitrary. With this mask, you must assign to the host PC an IP address beginning with `192.168.1.` and an arbitrary number. In our example we use: `192.168.1.2` for the host, so it is then on the same subnetwork with PicSight®-GigE having the default IP address `192.168.1.55`.

The gateway need not be set for this temporary TCP/IP settings (leave it empty).

Note that in case you do not want to touch your existing connection to the network, you would have to add additional Ethernet card (NIC) to your PC and configure the TCP/IP for the additional NIC.

After applying the changes (closing the Local Area Connection dialog) Windows change the IP address, usually without need to reboot. You can verify the change by the `ipconfig` command on the Command Prompt — it lists the current IP address.

Now you should test with `ping` again. It should succeed:

```
C:\>ping 192.168.1.55

Pinging 192.168.1.55 with 32 bytes of data:

Reply from 192.168.1.55: bytes=32 time=35ms TTL=128
Reply from 192.168.1.55: bytes=32 time=24ms TTL=128
Reply from 192.168.1.55: bytes=32 time=13ms TTL=128
Reply from 192.168.1.55: bytes=32 time=2ms TTL=128

Ping statistics for 192.168.1.55:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 35ms, Average = 18ms

C:\>
```

5.3. HTTP-based configuration

There is an HTTP server running on the PicSight®-GigE camera, so after verifying the TCP/IP connection is correct, you can connect to it using a web browser, for example Internet Explorer, Mozilla Firefox etc. To connect, type in the following URL: `http://192.168.1.55`. Following page should appear:

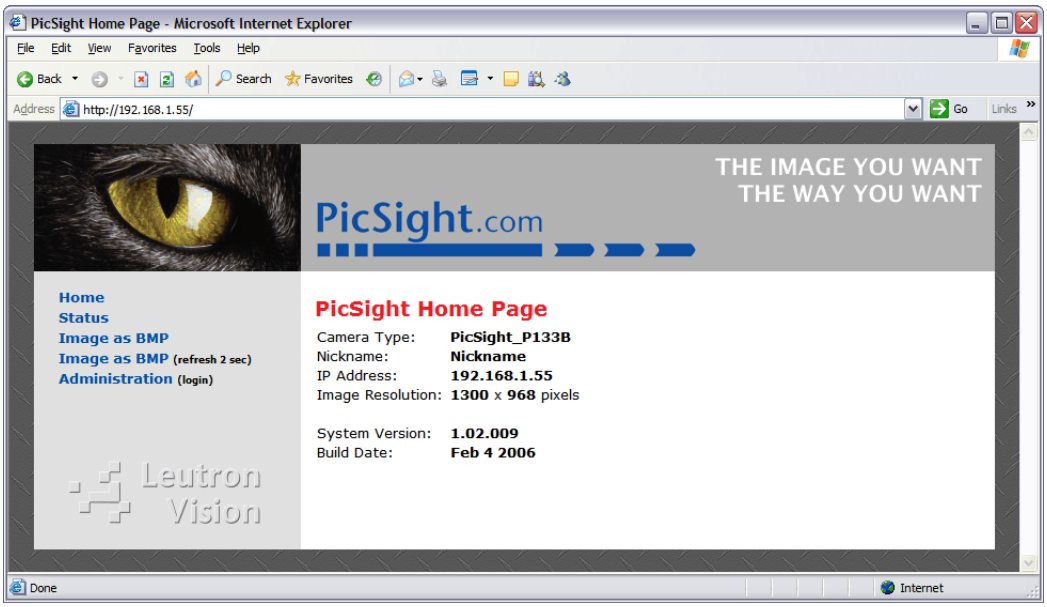

Figure 5.6. PicSight®-GigE homepage

Note that if you still cannot access this page, although the `ping` command succeeds, the problem might be in the firewall configuration on your PC — see Section 5.1, “Possible impact of a firewall” [p. 49].

5.3.1. Logging in, setting the IP address and nickname

The first step you probably will need to do, is to set new IP address. To do so, you must first log in. Click on the Administration link. A login dialog box will pop-up:

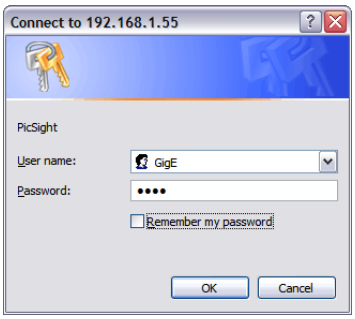

Figure 5.7. PicSight®-GigE HTTP configuration, login

From the factory the user name is set to `GigE` and the password to `gige`. The password can be changed (see Section 5.3.2, “Changing the password” [p. 55]). After successful login you will see additional links on the left side:

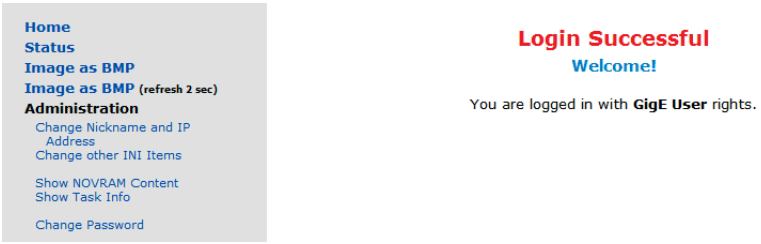

Figure 5.8. PicSight®-GigE HTTP configuration, administration options

Click on the Change Nickname and IP Address. The following form will be displayed:

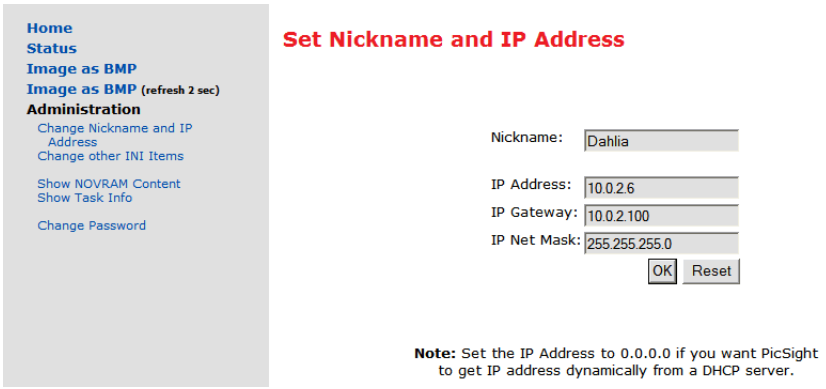

Figure 5.9. PicSight®-GigE HTTP configuration, nickname and IP address

Here you can set the desired IP address. The IP Gateway can be set to `0.0.0.0`.

In case you have a DHCP server in your network and want the PicSight®-GigE to get the IP address assigned automatically from the DHCP server during the boot, set the IP address to `0.0.0.0`. Note that if the DHCP server is not available, the PicSight®-GigE will not be then accessible at all. If you will want to access the PicSight®-GigE via the HTTP protocol, you will need to find the assigned IP address on the DHCP server.

You can also assign a “nickname” to the camera. It is highly recommended. The nickname becomes an identifier of the camera in the LV-SDS, so if you use nicknames, your application will be independent on IP addresses.

After confirming the changes by the OK button, the values are checked for validity. If not valid, an error message is displayed. If valid, the same page is displayed, with additional message below the red header: “Parameters successfully stored. Changes will become active after PicSight® reset”.

To reset PicSight®-GigE, disconnect it from the power supply for a short time or use the Reset PicSight® link in menu on the left side.

After reset, you can restore your network settings (if you changed them) and access the PicSight®-GigE with a new IP address — in our example `http://10.0.2.6`:

Figure 5.10. PicSight®-GigE HTTP configuration, new IP address

5.3.2. Changing the password

In case your camera is on a common network, to which other users have access, it is important to change the password, so that it is better protected against an unauthorized access. To change the password, click on the Change Password link:

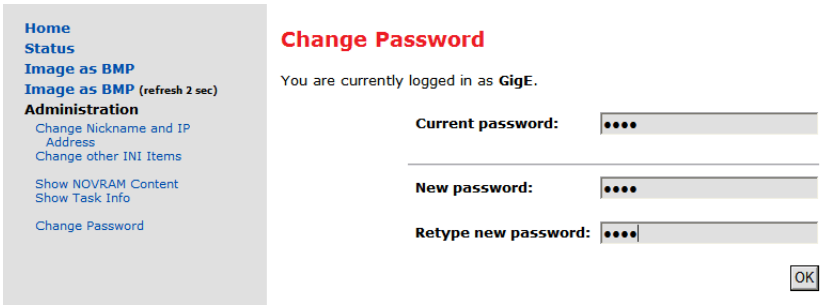

Figure 5.11. PicSight®-GigE HTTP configuration, changing the password

5.3.3. Getting an image in a web browser

When you click on the Image as BMP, the browser will display the last image acquired by the camera. In the second option, Image as BMP (refresh 2 sec) the browser asks for the image every 2 seconds, so you can have a simulation of live on the screen. You can stop it by pressing the Back button in the browser.

5.3.4. Logging out

The authentication scheme does not enable explicit logging out. The authentication data are kept by browser, so the if you want to log out, simply close the browser window.

5.4. Advanced network settings

5.4.1. Understanding the LAN traffic issues

The image data are streamed from the host (PicSight®-GigE) to client (PC) using the UDP protocol. In case some of the packets is not delivered in time, it is lost — the client does not ask for it again,

because such handshaking would increase significantly the network traffic and would introduce unwanted delays.

Normally, the packets are lost only in case there is some bottleneck or overflow on the network path.

One typical example is a wireless connection on the path. It has a lower bandwidth than the rest of the LAN. However, the host (PicSight®-GigE) is not aware of it (it can determine only the speed to the nearest port), so it simply tries to stream out the data as fast as possible, which can lead to the buffer overflow on the wireless gate. This kind of problem can be fixed by introducing an inter-packet delay, which reduces the bandwidth.

Note that the streaming with the reduced bandwidth need not have an impact to the image data delivery if the transfer is still fast enough to transfer all the image data before the next image is acquired. For example, if the camera is triggered, and thus has long time gaps between frames, the increase of the inter-packet delay can solve the problem without any side effects.

Another problem can occur when acquiring simultaneously from multiple cameras connected to single NIC through a switch, namely if they are all triggered at the same time. When the cameras start stream out the packets at the same time, the switch must serialize the packets to one output line. The capability of doing this depends on the switch internal construction and thus is different for various manufacturers and models. The main factor influencing this is the size of the memory buffer dedicated for each port. The higher is the amount of the memory, the better.

For example, the 8-port switch has 144 kB of memory equally split between the ports, so one port has 18 kB of memory. When using a streaming packet size of 9 kB, only 2 packets fit to the buffer. In case 3 cameras send a packet to the input ports at the same time, the switch must transfer 3 packets to the output port, and this (depending on the switch construction) can fail due to the memory on the output port not capable to hold all 3 packets (27 kB). The solution in such case would be to use a smaller packet size, for example 5.9 kB, so that all 3 packets fit in. Another problem can happen, if the outgoing line is too slow to send out all the packets before new 3 packets come from the cameras — then it is necessary to reduce the bandwidth by increasing the inter-packet delay, as already explained.

As mentioned, due to the internal construction of the switches, the capability of the switches to manage such critical situations differs from switch to switch. See Section 2.7, “Ethernet connection” [p. 20] for list of switches which have been successfully tested with PicSight®-GigE.

5.4.2. Packet sizes

The size of the packets sent over the network can influence significantly the effectiveness of sent data.

5.4.2.1. The Maximum Transmission Unit (MTU)

The MTU has to be set on both sides to the same value, on the host (PC) side as well as on the PicSight®-GigE side. Also, all devices along the network path from the host to the client (switches etc.) must support the used frame size.

5.4.2.2. The streaming packet size

Besides the MTU size setting, the streaming packet size can be set independently. This setting determines the size of the streaming packets during an image acquisition. This packet size must always be smaller than the MTU size, and as this packet size does not include the header size for UDP/IP, it should be always smaller by at least 50 bytes than the MTU size. While the MTU represents the maximum possible size, the streaming packet size represents the size actually used in the transmission.

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5.4.2.3. The impact on the network performance

The streaming packet size has a major impact to the network performance. The higher is the size of the packets, the smaller is the overhead which has to be sent for each packet. Less overhead means fewer data sent over the network and therefore smaller CPU utilization on both sides.

However, a disadvantage of larger packets is that the partition of the overall network bandwidth is no more guaranteed. If multiple devices are streaming at the same time using large packets, the network bus may become overloaded and packets are getting lost, as explained above.

Thus using the larger packet size is highly recommended for a high performance transmission with a few network members only. If multiple cameras have to stream at the same time, a smaller packet size has to be set.

5.4.3. Setting the MTU

On the PC side the setting is usually available in the NIC driver settings, which is available under menu Start → Settings → Control Panel → Network Connections → Local Area Connection → Properties:

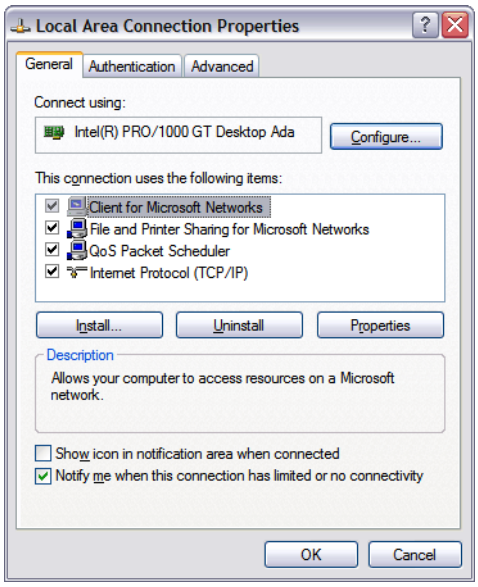

Figure 5.12. Network connection properties

After pressing the Configure button, a driver dependent dialog box appears. The one in our example below is from the Intel PRO/1000 adapter:

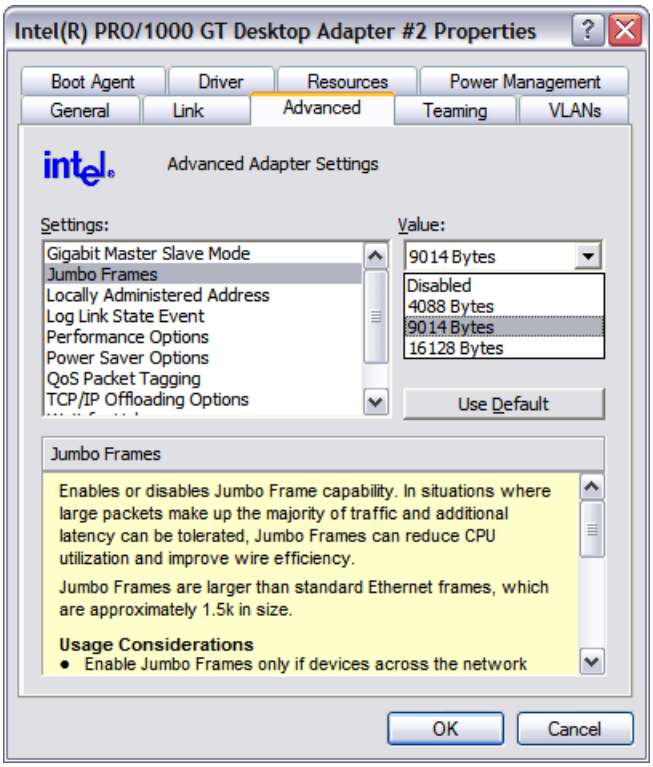

Figure 5.13. Network driver specific properties

The MTU settings is here available under the Jumbo Frames option, with a possibility to select from predefined values.

On the PicSight®-GigE side the MTU settings is available in the HTTP based configuration, in the Change Other INI Items page after successful login.

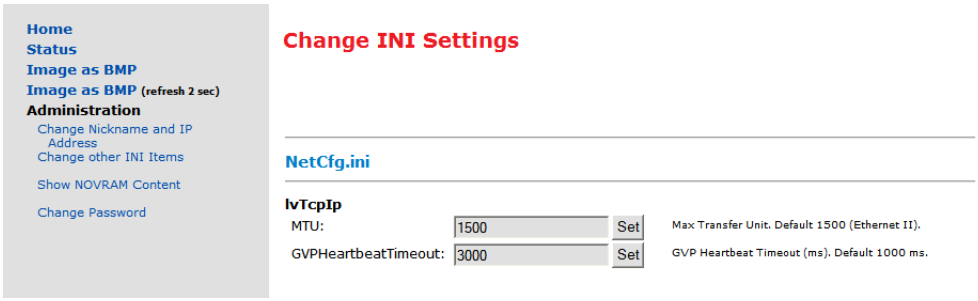

Figure 5.14. PicSight®-GigE HTTP configuration, INI settings

The number set here should be the same as on the PC side.

5.4.4. Setting the streaming packet size

The desired streaming packet size can be set on the host side in the `leutron.ini`file, Section `[LvGvp]`:

```
[LvGvp]
DefGvspPktSize=1400
```

This size has to be always at least by 50 bytes smaller than the MTU setting.

5.4.5. Setting the inter-packet delay

You can increase the inter-packet delay by setting the entry in the `leutron.ini` on the host side:

```
[LvGvp]
InterPktDelay=xxx
```

where *xxx* is the delay in microseconds. Note that increasing the inter-packet delay may slow down the streaming. See Section 5.4.1, “Understanding the LAN traffic issues” [p. 55] for details about this value.

5.4.6. Accessing PicSight®-GigE on a different subnet

The PicSight®-GigE cameras in the local network are found at LV-SDS startup by issuing a broadcast message in the local subnet. This only works for the PicSight®-GigE cameras with the IP addresses in the same subnet range as is the IP address of the host.

If PicSight®-GigE has to be accessed across the network boundaries of the local subnet, its IP address has to be defined as the `FixDiscoverIP` item in the `leutron.ini` file, in the `[LvBusCamNet]` section. For example

```
[LvBusCamNet]
FixDiscoverIP =10.0.0.23
```

For multiple PicSight®-GigE cameras write the IP addresses separated by a semicolon, such as:

```
[LvBusCamNet]
FixDiscoverIP=10.0.0.23;10.0.0.27;10.0.5.15
```

Note that the `FixDiscoverIP` address of the PicSight®-GigE cannot be arbitrary, it must be in a valid remote subnet, that means a subnet, to which the routing device of your LAN (the gateway) is able to redirect the packets.

In other words, if you want to access PicSight®-GigE with the default IP address `192.168.1.55`, which is out of your local subnet range, it is not enough to set it as `FixDiscoverIP`.

If a non-standard frame size is configured, the routing device must support this frame size as well. Note also that the routers are often configured with firewall mechanisms, which may block the streaming traffic.

Note: In LV-SDS till version 1.96.159 the `FixDiscoverIP` option did not exist, it had to be set in the `win.ini` file:

```
[Leutron Vision]
LvCamNet=10.0.0.23;10.0.0.27;10.0.5.15
```

5.5. Optimizing the network card performance

Besides the generic network settings (see Section 5.4, “Advanced network settings” [p. 55]), more network card specific tuning options might be required to optimize the performance.

For performance critical applications we recommend to use the network card Intel® PRO/1000 GT, which was well tested with PicSight®-GigE cameras and which provides very good performance,

especially when properly configured. See following screenshots showing the recommended performance-specific configuration options. Note that the screenshots contain also good explanation of every single option, so you should be able to apply similar settings also on another network card, if you cannot use the recommended model for any reason.

First open the network card properties dialog in the “Device manager”. Select the Advanced tab, option Performance Options and click the Properties button.

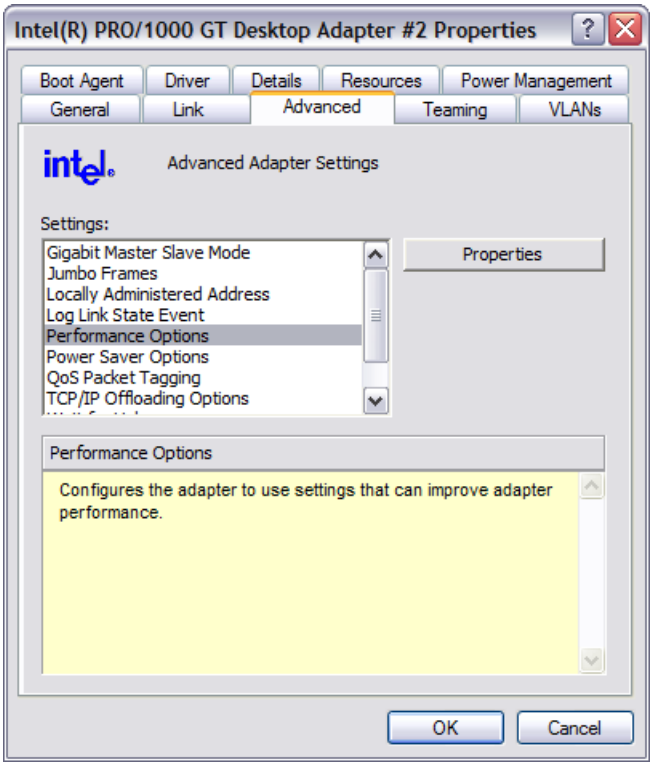

Figure 5.15. Configuring Intel PRO/1000 GT, Advanced properties

Another dialog will pop up, allowing to configure some performance specific options. The screenshots below document how all the options should be set up, including corresponding explanations.

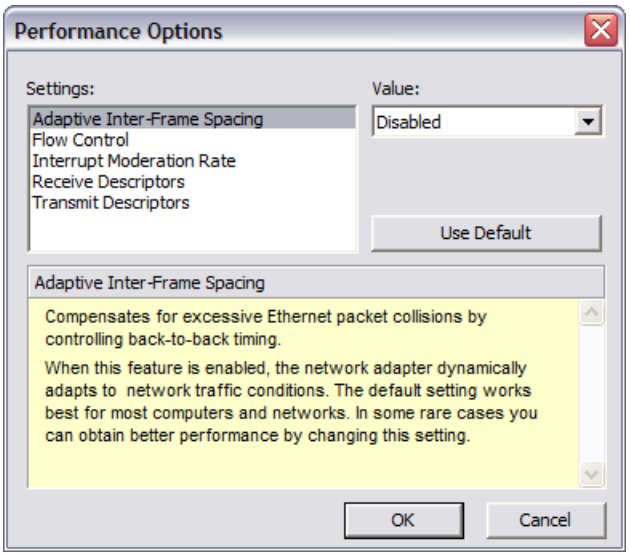
Performance Options
Settings:
Value:
Adaptive Inter-Frame Spacing
Flow Control
Interrupt Moderation Rate
Receive Descriptors
Transmit Descriptors
Disabled
Use Default
Adaptive Inter-Frame Spacing
Compensates for excessive Ethernet packet collisions by controlling back-to-back timing.
When this feature is enabled, the network adapter dynamically adapts to network traffic conditions. The default setting works best for most computers and networks. In some rare cases you can obtain better performance by changing this setting.
OK
Cancel

Figure 5.16. Configuring Intel PRO/1000 GT, Inter-Frame Spacing

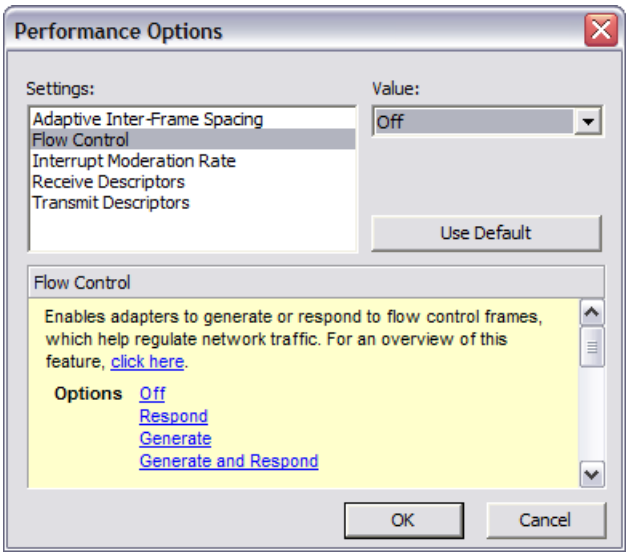

Figure 5.17. Configuring Intel PRO/1000 GT, Flow Control

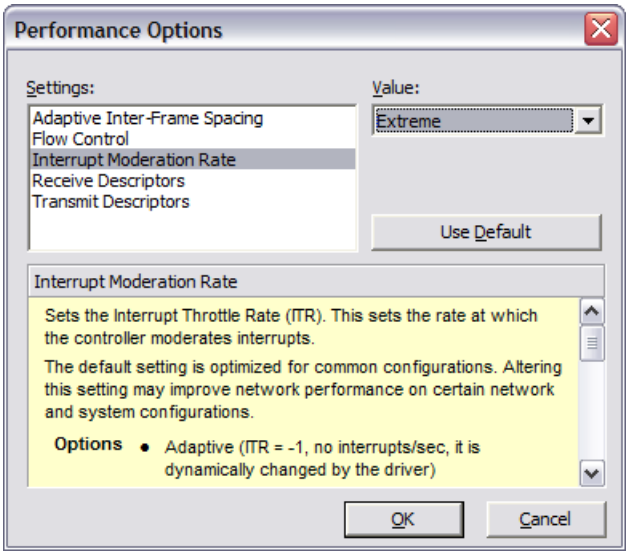
Performance Options
Settings:
Value:
Adaptive Inter-Frame Spacing
Flow Control
Interrupt Moderation Rate
Receive Descriptors
Transmit Descriptors
Extreme
Use Default
Interrupt Moderation Rate
Sets the Interrupt Throttle Rate (ITR). This sets the rate at which the controller moderates interrupts.
The default setting is optimized for common configurations. Altering this setting may improve network performance on certain network and system configurations.
Options
Adaptive (ITR = -1, no interrupts/sec, it is dynamically changed by the driver)
OK
Cancel

Figure 5.18. Configuring Intel PRO/1000 GT, Interrupt Moderation Rate

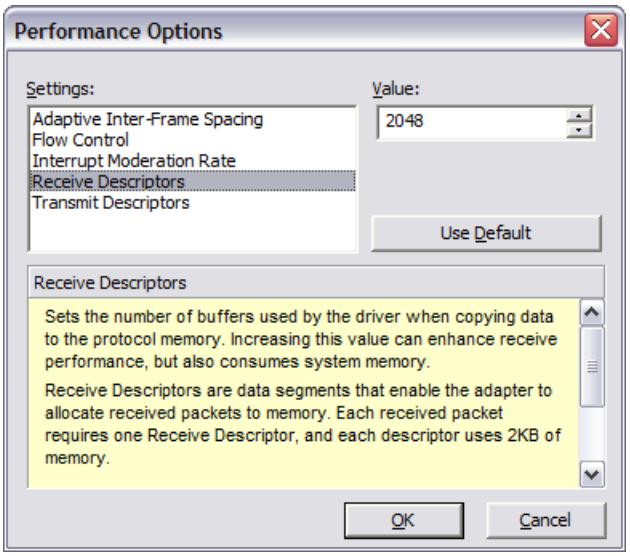
Performance Options
Settings:
Value:
Adaptive Inter-Frame Spacing
Flow Control
Interrupt Moderation Rate
Receive Descriptors
Transmit Descriptors
2048
Use Default
Receive Descriptors
Sets the number of buffers used by the driver when copying data to the protocol memory. Increasing this value can enhance receive performance, but also consumes system memory.
Receive Descriptors are data segments that enable the adapter to allocate received packets to memory. Each received packet requires one Receive Descriptor, and each descriptor uses 2KB of memory.
OK
Cancel

Figure 5.19. Configuring Intel PRO/1000 GT, Receive Descriptors

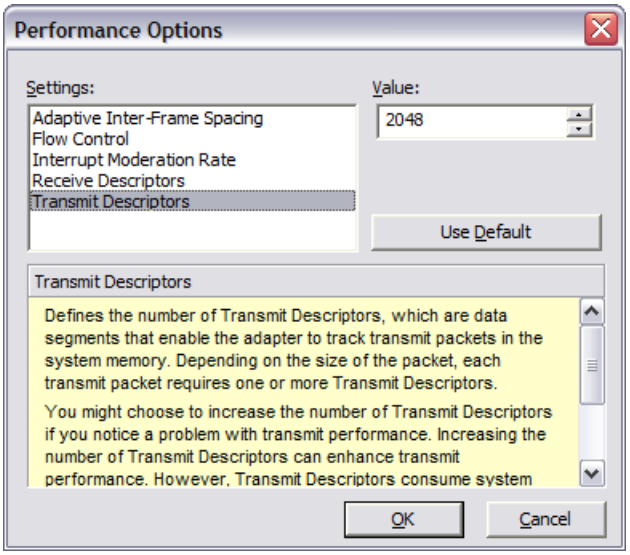
Performance Options
Settings:
Value:
Adaptive Inter-Frame Spacing
Flow Control
Interrupt Moderation Rate
Receive Descriptors
Transmit Descriptors
2048
Use Default
Transmit Descriptors
Defines the number of Transmit Descriptors, which are data segments that enable the adapter to track transmit packets in the system memory. Depending on the size of the packet, each transmit packet requires one or more Transmit Descriptors.
You might choose to increase the number of Transmit Descriptors if you notice a problem with transmit performance. Increasing the number of Transmit Descriptors can enhance transmit performance. However, Transmit Descriptors consume system
OK
Cancel

Figure 5.20. Configuring Intel PRO/1000 GT, Transmit Descriptors

The maximum packet size (jumbo frames) allowed by Intel® PRO/1000 GT™ is `16128` bytes. The corresponding streaming packet size (`DefGvspPktSize`, see Section 5.4, “Advanced network settings” [p. 55]) would be `16000`.

5.6. Maximize throughput in PicSight® demo

The previous sections discussed the most important configuration options to be considered for maximum network throughput between the camera(s) and the host. There are, however, some more conditions that might influence the camera performance, especially the camera's working mode and overall system load.

When experimenting with fast cameras in PicSight® demo, depending on the conditions used, you might observe the camera(s) performing with lower than maximal acquisition rate. To achieve the maximum data rate, you should:

- Optimize the network throughput by utilizing the configuration options discussed in previous sections, namely Section 5.4, “Advanced network settings” [p. 55] and Section 5.5, “Optimizing the network card performance” [p. 59].
- Connect the camera directly to the network card using a cross over cable, avoiding additional network components.
- If possible, use the camera in the free running mode (“Live” or “PauseOnRequest” mode in PicSight® demo). In triggered modes, where the camera waits for explicit software or hardware triggers, the maximum acquisition rate cannot be achieved.
- To minimize system load, if necessary, in PicSight® demo all the image processing should be switched off and “Relaxed painting” should be switched on.

5.7. Working mode and software controlled settings

When using the PicSight®-GigE and PicSight®-USB cameras in LV-SDS applications, one does not need to care about adjusting the working mode of the cameras — features such as trigger mode, pixel depth and so on. LV-SDS adjusts the camera automatically based on the current application configuration.

Runtime settings such as exposure time, gain or black level can be controlled directly using the familiar LV-SDS interface, see more details in Daisy manual or other programming manuals.

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Appendix A. Technical specifications for individual models

A.1. G32B-GigE-AR

Specification	G32B-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/2" CMOS, parallel readout, type Micron MT9V403
Monochrome/color	bayer pattern
Output image resolution (H×V)	656 × 494 pixels
Frame rate	196 fps
Video format	10-bit, single tap
Scanning	progressive
Pixel size (H×V)	9.9 × 9.9 µm
Sensor size (H×V)	6.52 × 4.89 mm
Shutter	global, 20 µs –1300 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	G32B-GigE (old version): 12V/6W G32B-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 401200: PicSight G32B-GigE-AR • 401201: PicSight G32B-GigE-AR-H (90° lens mount) • 401300: PicSight G32B-GigE-AR-RTF (Realtime function) • 401301: PicSight G32B-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.1. G32B-GigE-AR technical specifications

A.2. G32M-GigE-AR

Specification	G32M-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/2" CMOS, parallel readout, type Micron MT9V403
Monochrome/color	monochrome
Output image resolution (H×V)	656 × 494 pixels
Frame rate	196 fps
Video format	10-bit, single tap

Specification	G32M-GigE-AR
Scanning	progressive
Pixel size (H×V)	9.9 × 9.9 µm
Sensor size (H×V)	6.52 × 4.89 mm
Shutter	global, 20 µs –1300 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	G32M-GigE (old version): 12V/6W G32M-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 400200: PicSight G32M-GigE-AR • 400201: PicSight G32M-GigE-AR-H (90° lens mount) • 400300: PicSight G32M-GigE-AR-RTF (Realtime function) • 400301: PicSight G32M-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.2. G32M-GigE-AR technical specifications

A.3. G43AB-GigE-AR

Specification	G43AB-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/3" CMOS, parallel readout, type Micron MT9V033
Monochrome/color	bayer pattern
Output image resolution (H×V)	752 × 480 pixels
Frame rate	64 fps
Video format	10-bit, single tap
Scanning	progressive
Pixel size (H×V)	6 × 6 µm
Sensor size (H×V)	4.51 × 2.88 mm
Shutter	global, 29 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	G43AB-GigE (old version): 12V/6W G43AB-GigE-AR: 10-26V/5W

Specification	G43AB-GigE-AR
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 413200: PicSight G43AB-GigE-AR • 413201: PicSight G43AB-GigE-AR-H (90° lens mount) • 413300: PicSight G43AB-GigE-AR-RTF (Realtime function) • 413301: PicSight G43AB-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.3. G43AB-GigE-AR technical specifications

A.4. G43AM-GigE-AR

Specification	G43AM-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/3" CMOS, parallel readout, type Micron MT9V033
Monochrome/color	monochrome
Output image resolution (H×V)	752 × 480 pixels
Frame rate	64 fps
Video format	10-bit, single tap
Scanning	progressive
Pixel size (H×V)	6 × 6 µm
Sensor size (H×V)	4.51 × 2.88 mm
Shutter	global, 29 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	G43AM-GigE (old version): 12V/6W G43AM-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 412200: PicSight G43AM-GigE-AR • 412201: PicSight G43AM-GigE-AR-H (90° lens mount) • 412300: PicSight G43AM-GigE-AR-RTF (Realtime function) • 412301: PicSight G43AM-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.4. G43AM-GigE-AR technical specifications

A.5. G43B-GigE-AR

Specification	G43B-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/3" CMOS, parallel readout, type Micron MT9V022
Monochrome/color	bayer pattern
Output image resolution (H×V)	752 × 480 pixels
Frame rate	64 fps
Video format	10-bit, single tap
Scanning	progressive
Pixel size (H×V)	6 × 6 µm
Sensor size (H×V)	4.51 × 2.88 mm
Shutter	global, 29 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	G43B-GigE (old version): 12V/6W G43B-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 411200: PicSight G43B-GigE-AR • 411201: PicSight G43B-GigE-AR-H (90° lens mount) • 411300: PicSight G43B-GigE-AR-RTF (Realtime function) • 411301: PicSight G43B-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.5. G43B-GigE-AR technical specifications

A.6. G43M-GigE-AR

Specification	G43M-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/3" CMOS, parallel readout, type Micron MT9V022
Monochrome/color	monochrome
Output image resolution (H×V)	752 × 480 pixels
Frame rate	64 fps
Video format	10-bit, single tap
Scanning	progressive
Pixel size (H×V)	6 × 6 µm
Sensor size (H×V)	4.51 × 2.88 mm

Specification	G43M-GigE-AR
Shutter	global, 29 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	G43M-GigE (old version): 12V/6W G43M-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 410200: PicSight G43M-GigE-AR • 410201: PicSight G43M-GigE-AR-H (90° lens mount) • 410300: PicSight G43M-GigE-AR-RTF (Realtime function) • 410301: PicSight G43M-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.6. G43M-GigE-AR technical specifications

A.7. P133B-GigE-AR

Specification	P133B-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/2.7" CCD, interline transfer, type SONY ICX442AQ
Monochrome/color	bayer pattern
Output image resolution (H×V)	1304 × 976 pixels
Frame rate	9 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	4.1 × 4.1 µm
Sensor size (H×V)	6.23 × 5.09 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P133B-GigE (old version): 12V/6W P133B-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	

Specification	P133B-GigE-AR
Ordering information	• 151200: PicSight P133B-GigE-AR • 151201: PicSight P133B-GigE-AR-H (90° lens mount) • 151300: PicSight P133B-GigE-AR-RTF (Realtime function) • 151301: PicSight P133B-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.7. P133B-GigE-AR technical specifications

A.8. P141B-GigE-AR

Specification	P141B-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	2/3" CCD, interline transfer, type SONY ICX285
Monochrome/color	bayer pattern
Output image resolution (H×V)	1392 × 1040 pixels
Frame rate	20 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	6.45 × 6.45 µm
Sensor size (H×V)	10.2 × 8.3 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P141B-GigE (old version): 12V/6W P141B-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 181200: PicSight P141B-GigE-AR • 181201: PicSight P141B-GigE-AR-H (90° lens mount) • 181300: PicSight P141B-GigE-AR-RTF (Realtime function) • 181301: PicSight P141B-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.8. P141B-GigE-AR technical specifications

A.9. P141M-GigE-AR

Specification	P141M-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	2/3" CCD, interline transfer, type SONY ICX285
Monochrome/color	monochrome
Output image resolution (H×V)	1392 × 1040 pixels
Frame rate	20 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	6.45 × 6.45 µm
Sensor size (H×V)	10.2 × 8.3 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P141M-GigE (old version): 12V/6W P141M-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 180200: PicSight P141M-GigE-AR • 180201: PicSight P141M-GigE-AR-H (90° lens mount) • 180300: PicSight P141M-GigE-AR-RTF (Realtime function) • 180301: PicSight P141M-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.9. P141M-GigE-AR technical specifications

A.10. P142AB-GigE-AR

Specification	P142AB-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/2" CCD, interline transfer, type SONY ICX267
Monochrome/color	bayer pattern
Output image resolution (H×V)	1392 × 1040 pixels
Frame rate	15 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	4.65 × 4.65 µm
Sensor size (H×V)	7.6 × 6.2 mm

Specification	P142AB-GigE-AR
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P142AB-GigE (old version): 12V/6W P142AB-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 171200: PicSight P142AB-GigE-AR • 171201: PicSight P142AB-GigE-AR-H (90° lens mount) • 171300: PicSight P142AB-GigE-AR-RTF (Realtime function) • 171301: PicSight P142AB-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.10. P142AB-GigE-AR technical specifications

A.11. P142AM-GigE-AR

Specification	P142AM-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/2" CCD, interline transfer, type SONY ICX267
Monochrome/color	monochrome
Output image resolution (H×V)	1392 × 1040 pixels
Frame rate	15 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	4.65 × 4.65 µm
Sensor size (H×V)	7.6 × 6.2 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P142AM-GigE (old version): 12V/6W P142AM-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	

Specification	P142AM-GigE-AR
Ordering information	• 170200: PicSight P142AM-GigE-AR • 170201: PicSight P142AM-GigE-AR-H (90° lens mount) • 170300: PicSight P142AM-GigE-AR-RTF (Realtime function) • 170301: PicSight P142AM-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.11. P142AM-GigE-AR technical specifications

A.12. P202B-GigE-AR

Specification	P202B-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/1.8" CCD, interline transfer, type SONY ICX274
Monochrome/color	bayer pattern
Output image resolution (H×V)	1624 × 1236 pixels
Frame rate	14 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	4.4 × 4.4 µm
Sensor size (H×V)	8.5 × 6.8 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P202B-GigE (old version): 12V/6W P202B-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 211200: PicSight P202B-GigE-AR • 211201: PicSight P202B-GigE-AR-H (90° lens mount) • 211300: PicSight P202B-GigE-AR-RTF (Realtime function) • 211301: PicSight P202B-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.12. P202B-GigE-AR technical specifications

A.13. P202M-GigE-AR

Specification	P202M-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/1.8" CCD, interline transfer, type SONY ICX274
Monochrome/color	monochrome
Output image resolution (H×V)	1624 × 1236 pixels
Frame rate	14 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	4.4 × 4.4 µm
Sensor size (H×V)	8.5 × 6.8 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P202M-GigE (old version): 12V/6W P202M-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 210200: PicSight P202M-GigE-AR • 210201: PicSight P202M-GigE-AR-H (90° lens mount) • 210300: PicSight P202M-GigE-AR-RTF (Realtime function) • 210301: PicSight P202M-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.13. P202M-GigE-AR technical specifications

A.14. P203B-GigE-AR

Specification	P203B-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/2.7" CCD, interline transfer, type SONY ICX454JQF-J
Monochrome/color	bayer pattern
Output image resolution (H×V)	1648 × 1240 pixels
Frame rate	9 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	3.275 × 3.275 µm
Sensor size (H×V)	6.38 × 5.26 mm

Specification	P203B-GigE-AR
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P203B-GigE (old version): 12V/6W P203B-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 201200: PicSight P203B-GigE-AR • 201201: PicSight P203B-GigE-AR-H (90° lens mount) • 201300: PicSight P203B-GigE-AR-RTF (Realtime function) • 201301: PicSight P203B-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.14. P203B-GigE-AR technical specifications

A.15. P32B-GigE-AR

Specification	P32B-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/2" CCD, interline transfer, type SONY ICX414
Monochrome/color	bayer pattern
Output image resolution (H×V)	656 × 494 pixels
Frame rate	62 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	9.9 × 9.9 µm
Sensor size (H×V)	7.48 × 6.15 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P32B-GigE (old version): 12V/6W P32B-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	

Specification	P32B-GigE-AR
Ordering information	• 121200: PicSight P32B-GigE-AR • 121201: PicSight P32B-GigE-AR-H (90° lens mount) • 121300: PicSight P32B-GigE-AR-RTF (Realtime function) • 121301: PicSight P32B-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.15. P32B-GigE-AR technical specifications

A.16. P32M-GigE-AR

Specification	P32M-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/2" CCD, interline transfer, type SONY ICX414
Monochrome/color	monochrome
Output image resolution (H×V)	656 × 494 pixels
Frame rate	62 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	9.9 × 9.9 µm
Sensor size (H×V)	7.48 × 6.15 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P32M-GigE (old version): 12V/6W P32M-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 120200: PicSight P32M-GigE-AR • 120201: PicSight P32M-GigE-AR-H (90° lens mount) • 120300: PicSight P32M-GigE-AR-RTF (Realtime function) • 120301: PicSight P32M-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.16. P32M-GigE-AR technical specifications

A.17. P33B-GigE-AR

Specification	P33B-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/3" CCD, interline transfer, type SONY ICX424
Monochrome/color	bayer pattern
Output image resolution (H×V)	656 × 494 pixels
Frame rate	62 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	7.4 × 7.4 µm
Sensor size (H×V)	5.79 × 4.89 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P33B-GigE (old version): 12V/6W P33B-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 111200: PicSight P33B-GigE-AR • 111201: PicSight P33B-GigE-AR-H (90° lens mount) • 111300: PicSight P33B-GigE-AR-RTF (Realtime function) • 111301: PicSight P33B-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.17. P33B-GigE-AR technical specifications

A.18. P33M-GigE-AR

Specification	P33M-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/3" CCD, interline transfer, type SONY ICX424
Monochrome/color	monochrome
Output image resolution (H×V)	656 × 494 pixels
Frame rate	62 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	7.4 × 7.4 µm
Sensor size (H×V)	5.79 × 4.89 mm

Specification	P33M-GigE-AR
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P33M-GigE (old version): 12V/6W P33M-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 110200: PicSight P33M-GigE-AR • 110201: PicSight P33M-GigE-AR-H (90° lens mount) • 110300: PicSight P33M-GigE-AR-RTF (Realtime function) • 110301: PicSight P33M-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.18. P33M-GigE-AR technical specifications

A.19. P34B-GigE-AR

Specification	P34B-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/4" CCD, interline transfer, type SONY ICX098
Monochrome/color	bayer pattern
Output image resolution (H×V)	656 × 494 pixels
Frame rate	64 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	5.6 × 5.6 µm
Sensor size (H×V)	4.6 × 3.97 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P34B-GigE (old version): 12V/6W P34B-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	

Specification	P34B-GigE-AR
Ordering information	• 101200: PicSight P34B-GigE-AR Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table A.19. P34B-GigE-AR technical specifications

A.20. P34M-GigE-AR

Specification	P34M-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/4" CCD, interline transfer, type SONY ICX098
Monochrome/color	monochrome
Output image resolution (H×V)	656 × 494 pixels
Frame rate	64 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	5.6 × 5.6 µm
Sensor size (H×V)	4.6 × 3.97 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P34M-GigE (old version): 12V/6W P34M-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	
Ordering information	• 100200: PicSight P34M-GigE-AR • 100201: PicSight P34M-GigE-AR-H (90° lens mount) • 100300: PicSight P34M-GigE-AR-RTF (Realtime function) • 100301: PicSight P34M-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table A.20. P34M-GigE-AR technical specifications

A.21. P52B-GigE-AR

Specification	P52B-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s

Specification	P52B-GigE-AR
Sensor	1/2" CCD, interline transfer, type SONY ICX415
Monochrome/color	bayer pattern
Output image resolution (H×V)	776 × 582 pixels
Frame rate	63 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	8.3 × 8.3 µm
Sensor size (H×V)	7.48 × 6.15 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P52B-GigE (old version): 12V/6W P52B-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 131200: PicSight P52B-GigE-AR • 131201: PicSight P52B-GigE-AR-H (90° lens mount) • 131300: PicSight P52B-GigE-AR-RTF (Realtime function) • 131301: PicSight P52B-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.21. P52B-GigE-AR technical specifications

A.22. P52M-GigE-AR

Specification	P52M-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/2" CCD, interline transfer, type SONY ICX415
Monochrome/color	monochrome
Output image resolution (H×V)	776 × 582 pixels
Frame rate	63 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	8.3 × 8.3 µm
Sensor size (H×V)	7.48 × 6.15 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)

Specification	P52M-GigE-AR
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P52M-GigE (old version): 12V/6W P52M-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 130200: PicSight P52M-GigE-AR • 130201: PicSight P52M-GigE-AR-H (90° lens mount) • 130300: PicSight P52M-GigE-AR-RTF (Realtime function) • 130301: PicSight P52M-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.22. P52M-GigE-AR technical specifications

A.23. P83B-GigE-AR

Specification	P83B-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/3" CCD, interline transfer, type SONY ICX204
Monochrome/color	bayer pattern
Output image resolution (H×V)	1032 × 779 pixels
Frame rate	32 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	4.65 × 4.65 µm
Sensor size (H×V)	5.8 × 4.92 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P83B-GigE (old version): 12V/6W P83B-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	

Specification	P83B-GigE-AR
Ordering information	• 141200: PicSight P83B-GigE-AR • 141201: PicSight P83B-GigE-AR-H (90° lens mount) • 141300: PicSight P83B-GigE-AR-RTF (Realtime function) • 141301: PicSight P83B-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.23. P83B-GigE-AR technical specifications

A.24. P83M-GigE-AR

Specification	P83M-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/3" CCD, interline transfer, type SONY ICX204
Monochrome/color	monochrome
Output image resolution (H×V)	1032 × 779 pixels
Frame rate	32 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	4.65 × 4.65 µm
Sensor size (H×V)	5.8 × 4.92 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P83M-GigE (old version): 12V/6W P83M-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 140200: PicSight P83M-GigE-AR • 140201: PicSight P83M-GigE-AR-H (90° lens mount) • 140300: PicSight P83M-GigE-AR-RTF (Realtime function) • 140301: PicSight P83M-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.24. P83M-GigE-AR technical specifications

A.25. R132M-GigE-AR

Specification	R132M-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/2" CMOS, sequential readout, type Micron MT9M001
Monochrome/color	monochrom
Output image resolution (H×V)	1280 × 1024 pixels
Frame rate	30 fps
Video format	10-bit, single tap
Scanning	progressive
Pixel size (H×V)	5.2 × 5.2 µm
Sensor size (H×V)	6.66 × 5.32 mm
Shutter	rolling, 40 µs –800 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	R132M-GigE (old version): 12V/6W R132M-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 420200: PicSight R132M-GigE-AR • 420201: PicSight R132M-GigE-AR-H (90° lens mount) • 420300: PicSight R132M-GigE-AR-RTF (Realtime function) • 420301: PicSight R132M-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.25. R132M-GigE-AR technical specifications

A.26. R312AB-GigE-AR

Specification	R312AB-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/2" CMOS, sequential readout, type Micron MT9T001
Monochrome/color	bayer pattern
Output image resolution (H×V)	2048 × 1536 pixels
Frame rate	12 fps
Video format	10-bit, single tap
Scanning	progressive
Pixel size (H×V)	3.2 × 3.2 µm
Sensor size (H×V)	6.55 × 4.92 mm

Specification	R312AB-GigE-AR
Shutter	rolling, 50 µs –800 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	R312AB-GigE (old version): 12V/6W R312AB-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 441200: PicSight R312AB-GigE-AR • 441201: PicSight R312AB-GigE-AR-H (90° lens mount) • 441300: PicSight R312AB-GigE-AR-RTF (Realtime function) • 441301: PicSight R312AB-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.26. R312AB-GigE-AR technical specifications

A.27. R492B-GigE-AR

Specification	R492B-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/1.8" CMOS, sequential readout, type OmniVision OV5610
Monochrome/color	bayer pattern
Output image resolution (H×V)	2542 × 1944 pixels
Frame rate	2 fps
Video format	10-bit, single tap
Scanning	progressive
Pixel size (H×V)	2.775 × 2.775 µm
Sensor size (H×V)	7.05 × 5.39 mm
Shutter	rolling
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	R492B-GigE (old version): 12V/6W R492B-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	

Specification	R492B-GigE-AR
Ordering information	• 551200: PicSight R492B-GigE-AR • 551201: PicSight R492B-GigE-AR-H (90° lens mount) • 551300: PicSight R492B-GigE-AR-RTF (Realtime function) • 551301: PicSight R492B-GigE-AR-RTF-H (Realtime function and 90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.27. R492B-GigE-AR technical specifications

A.28. T33I-GigE-AR

Specification	T33I-GigE-AR
Interface	Ethernet 1000/100/10 Mb/s
Sensor	1/3" CCD, frame transfer, type Texas Instruments TC237B
Monochrome/color	infrared
Output image resolution (H×V)	640 × 494 pixels
Frame rate	31 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	7.4 × 7.4 µm
Sensor size (H×V)	4.9 × 3.8 mm
Shutter	global, 20 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	T33I-GigE (old version): 12V/6W T33I-GigE-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, "Technical specifications" [p. 12] or in other parts of the manual.	
Ordering information	• 700100: PicSight T33I-GigE • 700105: PicSight T33I-GigE-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, "PicSight®-GigE camera accessories" [p. 12].

Table A.28. T33I-GigE-AR technical specifications

Appendix B. Technical specifications for the “smart” models

B.1. G32B-Smartx02-AR

Specification	G32B-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — G32B-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — G32B-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/2" CMOS, parallel readout, type Micron MT9V403
Monochrome/color	bayer pattern
Output image resolution (H×V)	656 × 494 pixels
Frame rate	196 fps
Video format	10-bit, single tap
Scanning	progressive
Pixel size (H×V)	9.9 × 9.9 µm
Sensor size (H×V)	6.52 × 4.89 mm
Shutter	global, 20 µs –1300 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	G32B-Smart (old version): 12V/6W G32B-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	
Ordering information	• 401650: PicSight G32B-Smart702-AR • 401651: PicSight G32B-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.1. G32B-Smartx02-AR technical specifications

B.2. G32M-Smartx02-AR

Specification	G32M-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s

Specification	G32M-Smartx02-AR
Smart technology — G32M-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — G32M-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/2" CMOS, parallel readout, type Micron MT9V403
Monochrome/color	monochrome
Output image resolution (H×V)	656 × 494 pixels
Frame rate	196 fps
Video format	10-bit, single tap
Scanning	progressive
Pixel size (H×V)	9.9 × 9.9 µm
Sensor size (H×V)	6.52 × 4.89 mm
Shutter	global, 20 µs –1300 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	G32M-Smart (old version): 12V/6W G32M-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	
Ordering information	• 400650: PicSight G32M-Smart702-AR • 400651: PicSight G32M-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.2. G32M-Smartx02-AR technical specifications

B.3. G43AB-Smartx02-AR

Specification	G43AB-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — G43AB-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — G43AB-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/3" CMOS, parallel readout, type Micron MT9V033
Monochrome/color	bayer pattern

Specification	G43AB-Smartx02-AR
Output image resolution (H×V)	752 × 480 pixels
Frame rate	64 fps
Video format	10-bit, single tap
Scanning	progressive
Pixel size (H×V)	6 × 6 µm
Sensor size (H×V)	4.51 × 2.88 mm
Shutter	global, 29 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	G43AB-Smart (old version): 12V/6W G43AB-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	
Ordering information	• 413650: PicSight G43AB-Smart702-AR • 413651: PicSight G43AB-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.3. G43AB-Smartx02-AR technical specifications

B.4. G43AM-Smartx02-AR

Specification	G43AM-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — G43AM-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — G43AM-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/3" CMOS, parallel readout, type Micron MT9V033
Monochrome/color	monochrome
Output image resolution (H×V)	752 × 480 pixels
Frame rate	64 fps
Video format	10-bit, single tap
Scanning	progressive
Pixel size (H×V)	6 × 6 µm
Sensor size (H×V)	4.51 × 2.88 mm
Shutter	global, 29 µs –20 ms

Specification	G43AM-Smartx02-AR
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	G43AM-Smart (old version): 12V/6W G43AM-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	
Ordering information	• 412650: PicSight G43AM-Smart702-AR • 412651: PicSight G43AM-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.4. G43AM-Smartx02-AR technical specifications

B.5. G43B-Smartx02-AR

Specification	G43B-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — G43B-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — G43B-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/3" CMOS, parallel readout, type Micron MT9V022
Monochrome/color	bayer pattern
Output image resolution (H×V)	752 × 480 pixels
Frame rate	64 fps
Video format	10-bit, single tap
Scanning	progressive
Pixel size (H×V)	6 × 6 µm
Sensor size (H×V)	4.51 × 2.88 mm
Shutter	global, 29 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	G43B-Smart (old version): 12V/6W G43B-Smartx02-AR: 10-26V/5W

Specification	G43B-Smartx02-AR
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	
Ordering information	• 411650: PicSight G43B-Smart702-AR • 411651: PicSight G43B-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.5. G43B-Smartx02-AR technical specifications

B.6. G43M-Smartx02-AR

Specification	G43M-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — G43M-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — G43M-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/3" CMOS, parallel readout, type Micron MT9V022
Monochrome/color	monochrome
Output image resolution (H×V)	752 × 480 pixels
Frame rate	64 fps
Video format	10-bit, single tap
Scanning	progressive
Pixel size (H×V)	6 × 6 µm
Sensor size (H×V)	4.51 × 2.88 mm
Shutter	global, 29 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	G43M-Smart (old version): 12V/6W G43M-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	G43M-Smartx02-AR
Ordering information	• 410650: PicSight G43M-Smart702-AR • 410651: PicSight G43M-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.6. G43M-Smartx02-AR technical specifications

B.7. P133B-Smartx02-AR

Specification	P133B-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — P133B-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — P133B-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/2.7" CCD, interline transfer, type SONY ICX442AQ
Monochrome/color	bayer pattern
Output image resolution (H×V)	1304 × 976 pixels
Frame rate	9 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	4.1 × 4.1 µm
Sensor size (H×V)	6.23 × 5.09 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P133B-Smart (old version): 12V/6W P133B-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	P133B-Smartx02-AR
Ordering information	• 151650: PicSight P133B-Smart702-AR • 151651: PicSight P133B-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.7. P133B-Smartx02-AR technical specifications

B.8. P141B-Smartx02-AR

Specification	P141B-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — P141B-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — P141B-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	2/3" CCD, interline transfer, type SONY ICX285
Monochrome/color	bayer pattern
Output image resolution (H×V)	1392 × 1040 pixels
Frame rate	20 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	6.45 × 6.45 µm
Sensor size (H×V)	10.2 × 8.3 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P141B-Smart (old version): 12V/6W P141B-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	P141B-Smartx02-AR
Ordering information	• 181650: PicSight P141B-Smart702-AR • 181651: PicSight P141B-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.8. P141B-Smartx02-AR technical specifications

B.9. P141M-Smartx02-AR

Specification	P141M-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — P141M-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — P141M-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	2/3" CCD, interline transfer, type SONY ICX285
Monochrome/color	monochrome
Output image resolution (H×V)	1392 × 1040 pixels
Frame rate	20 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	6.45 × 6.45 µm
Sensor size (H×V)	10.2 × 8.3 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P141M-Smart (old version): 12V/6W P141M-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	P141M-Smartx02-AR
Ordering information	• 180650: PicSight P141M-Smart702-AR • 180651: PicSight P141M-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.9. P141M-Smartx02-AR technical specifications

B.10. P142AB-Smartx02-AR

Specification	P142AB-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — P142AB-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — P142AB-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/2" CCD, interline transfer, type SONY ICX267
Monochrome/color	bayer pattern
Output image resolution (H×V)	1392 × 1040 pixels
Frame rate	15 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	4.65 × 4.65 µm
Sensor size (H×V)	7.6 × 6.2 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P142AB-Smart (old version): 12V/6W P142AB-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	P142AB-Smartx02-AR
Ordering information	• 171650: PicSight P142AB-Smart702-AR • 171651: PicSight P142AB-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.10. P142AB-Smartx02-AR technical specifications

B.11. P142AM-Smartx02-AR

Specification	P142AM-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — P142AM-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — P142AM-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/2" CCD, interline transfer, type SONY ICX267
Monochrome/color	monochrome
Output image resolution (H×V)	1392 × 1040 pixels
Frame rate	15 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	4.65 × 4.65 µm
Sensor size (H×V)	7.6 × 6.2 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P142AM-Smart (old version): 12V/6W P142AM-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	P142AM-Smartx02-AR
Ordering information	• 170650: PicSight P142AM-Smart702-AR • 170651: PicSight P142AM-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.11. P142AM-Smartx02-AR technical specifications

B.12. P202B-Smartx02-AR

Specification	P202B-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — P202B-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — P202B-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/1.8" CCD, interline transfer, type SONY ICX274
Monochrome/color	bayer pattern
Output image resolution (H×V)	1624 × 1236 pixels
Frame rate	14 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	4.4 × 4.4 µm
Sensor size (H×V)	8.5 × 6.8 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P202B-Smart (old version): 12V/6W P202B-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	P202B-Smartx02-AR
Ordering information	• 211650: PicSight P202B-Smart702-AR • 211651: PicSight P202B-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.12. P202B-Smartx02-AR technical specifications

B.13. P202M-Smartx02-AR

Specification	P202M-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — P202M-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — P202M-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/1.8" CCD, interline transfer, type SONY ICX274
Monochrome/color	monochrome
Output image resolution (H×V)	1624 × 1236 pixels
Frame rate	14 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	4.4 × 4.4 µm
Sensor size (H×V)	8.5 × 6.8 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P202M-Smart (old version): 12V/6W P202M-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	P202M-Smartx02-AR
Ordering information	• 210650: PicSight P202M-Smart702-AR • 210651: PicSight P202M-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.13. P202M-Smartx02-AR technical specifications

B.14. P203B-Smartx02-AR

Specification	P203B-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — P203B-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — P203B-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/2.7" CCD, interline transfer, type SONY ICX454JQF-J
Monochrome/color	bayer pattern
Output image resolution (H×V)	1648 × 1240 pixels
Frame rate	9 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	3.275 × 3.275 µm
Sensor size (H×V)	6.38 × 5.26 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P203B-Smart (old version): 12V/6W P203B-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	P203B-Smartx02-AR
Ordering information	• 201650: PicSight P203B-Smart702-AR • 201651: PicSight P203B-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.14. P203B-Smartx02-AR technical specifications

B.15. P32B-Smartx02-AR

Specification	P32B-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — P32B-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — P32B-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/2" CCD, interline transfer, type SONY ICX414
Monochrome/color	bayer pattern
Output image resolution (H×V)	656 × 494 pixels
Frame rate	62 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	9.9 × 9.9 µm
Sensor size (H×V)	7.48 × 6.15 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P32B-Smart (old version): 12V/6W P32B-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	P32B-Smartx02-AR
Ordering information	• 121650: PicSight P32B-Smart702-AR • 121651: PicSight P32B-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.15. P32B-Smartx02-AR technical specifications

B.16. P32M-Smartx02-AR

Specification	P32M-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — P32M-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — P32M-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/2" CCD, interline transfer, type SONY ICX414
Monochrome/color	monochrome
Output image resolution (H×V)	656 × 494 pixels
Frame rate	62 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	9.9 × 9.9 µm
Sensor size (H×V)	7.48 × 6.15 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P32M-Smart (old version): 12V/6W P32M-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	P32M-Smartx02-AR
Ordering information	• 120650: PicSight P32M-Smart702-AR • 120651: PicSight P32M-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.16. P32M-Smartx02-AR technical specifications

B.17. P33B-Smartx02-AR

Specification	P33B-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — P33B-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — P33B-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/3" CCD, interline transfer, type SONY ICX424
Monochrome/color	bayer pattern
Output image resolution (H×V)	656 × 494 pixels
Frame rate	62 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	7.4 × 7.4 µm
Sensor size (H×V)	5.79 × 4.89 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P33B-Smart (old version): 12V/6W P33B-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	P33B-Smartx02-AR
Ordering information	• 111650: PicSight P33B-Smart702-AR • 111651: PicSight P33B-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.17. P33B-Smartx02-AR technical specifications

B.18. P33M-Smartx02-AR

Specification	P33M-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — P33M-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — P33M-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/3" CCD, interline transfer, type SONY ICX424
Monochrome/color	monochrome
Output image resolution (H×V)	656 × 494 pixels
Frame rate	62 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	7.4 × 7.4 µm
Sensor size (H×V)	5.79 × 4.89 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P33M-Smart (old version): 12V/6W P33M-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	P33M-Smartx02-AR
Ordering information	• 110650: PicSight P33M-Smart702-AR • 110651: PicSight P33M-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.18. P33M-Smartx02-AR technical specifications

B.19. P34B-Smartx02-AR

Specification	P34B-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — P34B-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — P34B-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/4" CCD, interline transfer, type SONY ICX098
Monochrome/color	bayer pattern
Output image resolution (H×V)	656 × 494 pixels
Frame rate	64 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	5.6 × 5.6 µm
Sensor size (H×V)	4.6 × 3.97 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P34B-Smart (old version): 12V/6W P34B-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	P34B-Smartx02-AR
Ordering information	• 101650: PicSight P34B-Smart702-AR • 101651: PicSight P34B-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.19. P34B-Smartx02-AR technical specifications

B.20. P34M-Smartx02-AR

Specification	P34M-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — P34M-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — P34M-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/4" CCD, interline transfer, type SONY ICX098
Monochrome/color	monochrome
Output image resolution (H×V)	656 × 494 pixels
Frame rate	64 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	5.6 × 5.6 µm
Sensor size (H×V)	4.6 × 3.97 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P34M-Smart (old version): 12V/6W P34M-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	P34M-Smartx02-AR
Ordering information	• 100650: PicSight P34M-Smart702-AR • 100651: PicSight P34M-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.20. P34M-Smartx02-AR technical specifications

B.21. P52B-Smartx02-AR

Specification	P52B-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — P52B-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — P52B-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/2" CCD, interline transfer, type SONY ICX415
Monochrome/color	bayer pattern
Output image resolution (H×V)	776 × 582 pixels
Frame rate	63 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	8.3 × 8.3 µm
Sensor size (H×V)	7.48 × 6.15 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P52B-Smart (old version): 12V/6W P52B-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	P52B-Smartx02-AR
Ordering information	• 131650: PicSight P52B-Smart702-AR • 131651: PicSight P52B-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.21. P52B-Smartx02-AR technical specifications

B.22. P52M-Smartx02-AR

Specification	P52M-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — P52M-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — P52M-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/2" CCD, interline transfer, type SONY ICX415
Monochrome/color	monochrome
Output image resolution (H×V)	776 × 582 pixels
Frame rate	63 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	8.3 × 8.3 µm
Sensor size (H×V)	7.48 × 6.15 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P52M-Smart (old version): 12V/6W P52M-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	P52M-Smartx02-AR
Ordering information	• 130650: PicSight P52M-Smart702-AR • 130651: PicSight P52M-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.22. P52M-Smartx02-AR technical specifications

B.23. P83B-Smartx02-AR

Specification	P83B-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — P83B-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — P83B-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/3" CCD, interline transfer, type SONY ICX204
Monochrome/color	bayer pattern
Output image resolution (H×V)	1032 × 779 pixels
Frame rate	32 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	4.65 × 4.65 µm
Sensor size (H×V)	5.8 × 4.92 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P83B-Smart (old version): 12V/6W P83B-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	P83B-Smartx02-AR
Ordering information	• 141650: PicSight P83B-Smart702-AR • 141651: PicSight P83B-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.23. P83B-Smartx02-AR technical specifications

B.24. P83M-Smartx02-AR

Specification	P83M-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — P83M-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — P83M-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/3" CCD, interline transfer, type SONY ICX204
Monochrome/color	monochrome
Output image resolution (H×V)	1032 × 779 pixels
Frame rate	32 fps
Video format	12-bit, single tap
Scanning	progressive
Pixel size (H×V)	4.65 × 4.65 µm
Sensor size (H×V)	5.8 × 4.92 mm
Shutter	global, 10 µs –20 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	P83M-Smart (old version): 12V/6W P83M-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	P83M-Smartx02-AR
Ordering information	• 140650: PicSight P83M-Smart702-AR • 140651: PicSight P83M-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.24. P83M-Smartx02-AR technical specifications

B.25. R132M-Smartx02-AR

Specification	R132M-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — R132M-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — R132M-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/2" CMOS, sequential readout, type Micron MT9M001
Monochrome/color	monochrom
Output image resolution (H×V)	1280 × 1024 pixels
Frame rate	30 fps
Video format	10-bit, single tap
Scanning	progressive
Pixel size (H×V)	5.2 × 5.2 µm
Sensor size (H×V)	6.66 × 5.32 mm
Shutter	rolling, 40 µs –800 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	R132M-Smart (old version): 12V/6W R132M-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	R132M-Smartx02-AR
Ordering information	• 420650: PicSight R132M-Smart702-AR • 420651: PicSight R132M-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.25. R132M-Smartx02-AR technical specifications

B.26. R312AB-Smartx02-AR

Specification	R312AB-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — R312AB-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — R312AB-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/2" CMOS, sequential readout, type Micron MT9T001
Monochrome/color	bayer pattern
Output image resolution (H×V)	2048 × 1536 pixels
Frame rate	12 fps
Video format	10-bit, single tap
Scanning	progressive
Pixel size (H×V)	3.2 × 3.2 µm
Sensor size (H×V)	6.55 × 4.92 mm
Shutter	rolling, 50 µs –800 ms
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	R312AB-Smart (old version): 12V/6W R312AB-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	R312AB-Smartx02-AR
Ordering information	• 441650: PicSight R312AB-Smart702-AR • 441651: PicSight R312AB-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.26. R312AB-Smartx02-AR technical specifications

B.27. R492B-Smartx02-AR

Specification	R492B-Smartx02-AR
Interface	Ethernet 1000/100/10 Mb/s
Smart technology — R492B-Smart502-AR	32-bit RISC processor PNX0192/300MHz, 64MB RAM, 32MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Smart technology — R492B-Smart702-AR	32-bit RISC processor PNX1702/500MHz, Hardware FPU, 256MB RAM, 64MB Flash memory, real-time operating system, C/C++ compiler, various APIs
Sensor	1/1.8" CMOS, sequential readout, type OmniVision OV5610
Monochrome/color	bayer pattern
Output image resolution (H×V)	2542 × 1944 pixels
Frame rate	2 fps
Video format	10-bit, single tap
Scanning	progressive
Pixel size (H×V)	2.775 × 2.775 µm
Sensor size (H×V)	7.05 × 5.39 mm
Shutter	rolling
Trigger modes	Normal (free running), pulse-width, edge-preselect
Mount	C-mount (CS-mount on request)
Dimension	44.8×31.4×92.51 mm (W×H×L, without connectors)
Weight	145 g
Power input	R492B-Smart (old version): 12V/6W R492B-Smartx02-AR: 10-26V/5W
Other features common to the entire camera family might be listed in Section 1.8, “Technical specifications” [p. 12] or in other parts of the manual.	

Specification	R492B-Smartx02-AR
Ordering information	• 551650: PicSight R492B-Smart702-AR • 551651: PicSight R492B-Smart702-AR-H (90° lens mount) • 100600: PicSight P34M-Smart502-AR • 100601: PicSight P34M-Smart502-AR-H (90° lens mount) Check latest price list or contact us to learn if more options are available. Camera accessories, including their ordering numbers might be listed in Section 1.7, “PicSight®-GigE camera accessories” [p. 12].

Table B.27. R492B-Smartx02-AR technical specifications

Appendix C. Related datasheets

C.1. TLP280, photocoupler GaAs Ired & photo — transistor

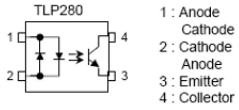
TOSHIBA Photocoupler GaAs Ired & Photo−Transistor TLP280,TLP280−4

Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating		Unit
			TLP280	TLP280−4	
LED	Forward current	$I_{F(RMS)}$	±50		mA
	Forward current derating	ΔI_F /°C	−0.7 (Ta ≥ 53°C)	−0.5 (Ta ≥ 25°C)	mA /°C
	Pulse forward current	I_{FP}	±1 (100μs pulse, 100pps)		A
	Junction temperature	T_j	125		°C
Detector	Collector−emitter voltage	V_{CEO}	80		V
	Emitter−collector voltage	V_{ECO}	7		V
	Collector current	I_C	50		mA
	Collector power dissipation (1 circuit)	P_C	150	100	mW
	Collector power dissipation derating (Ta ≥ 25°C) (1 circuit)	ΔP_C /°C	−1.5	−1.0	mW /°C
	Junction temperature	T_j	125		°C
Storage temperature range		T_{stg}	−55~125		°C
Operating temperature range		T_{opr}	−55~100		°C
Lead soldering temperature		T_{sol}	260 (10s)		°C
Total package power dissipation (1 circuit)		P_T	200	170	mW
Total package power dissipation derating (Ta ≥ 25°C) (1 circuit)		ΔP_T /°C	−2.0	−1.7	mW /°C
Isolation voltage (Note)		BV_S	2500 (AC, 1min., R.H.≤ 60%)		Vrms

(Note): Device considered a two terminal device: LED side pins shorted together and detector side pins shorted together.

Pin Configuration (top view)



1 : Anode
Cathode
2 : Cathode
Anode
3 : Emitter
4 : Collector

- Collector−emitter voltage: 80 V (min)
- Current transfer ratio: 50% (min)
  Rank GB: 100% (min)
- Isolation voltage: 2500 Vrms (min)
- UL recognized: UL1577, file No. E67349
- BSI approved: BS EN 60065: 1994,
  BS EN 41003: 1997
  Certificate No. 8143, 8144

Individual Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ	Max	Unit
LED	Forward voltage	V_F	I_F = ±10 mA	1.0	1.15	1.3	V
	Capacitance	C_T	V = 0, f = 1 MHz	—	60	—	pF
Detector	Collector−emitter breakdown voltage	$V_{(BR)\ CEO}$	I_C = 0.5 mA	80	—	—	V
	Emitter−collector breakdown voltage	$V_{(BR)\ ECO}$	I_E = 0.1 mA	7	—	—	V
	Collector dark current (Note 1)	I_{CEO}	V_{CE} = 48 V, Ambient light below (100 1x)	—	0.01 (2)	0.1 (10)	μA
			V_{CE} = 48 V, Ta = 85°C Ambient light below (100 1x)	—	2 (4)	50 (50)	μA
	Capacitance (collector to emitter)	C_{CE}	V = 0, f = 1 MHz	—	10	—	pF

(Note 1): Because of the construction, leak current might be increased by ambient light. Please use photocoupler with less ambient light.

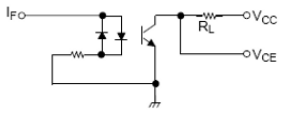
Isolation Characteristics (Ta = 25°C)

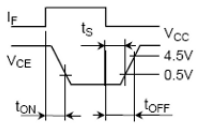
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C_S	V_S = 0V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R_S	V_S = 500 V, R.H.≤ 60%	5×10^{10}	10^{14}	—	Ω
Isolation voltage	BV_S	AC, 1 minute	2500	—	—	V_{rms}
		AC, 1 second, in oil	—	5000	—	
		DC, 1 minute, in oil	—	5000	—	V_{dc}

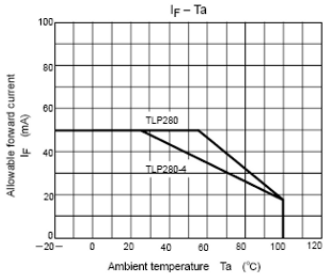
Switching Characteristics (Ta = 25°C)

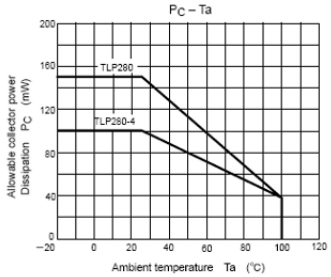
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	t_r	V_{CC} = 10 V, I_C = 2 mA R_L = 100Ω	—	2	—	μs
Fall time	t_f		—	3	—	
Turn−on time	t_{on}		—	3	—	
Turn−off time	t_{off}		—	3	—	
Turn−on time	t_{ON}	R_L = 1.9 kΩ (Fig.1) V_{CC} = 5 V, I_F = ±16 mA	—	2	—	μs
Storage time	t_s		—	25	—	
Turn−off time	t_{OFF}		—	40	—	

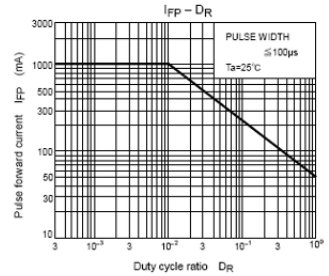
(Fig. 1): Switching time test circuit

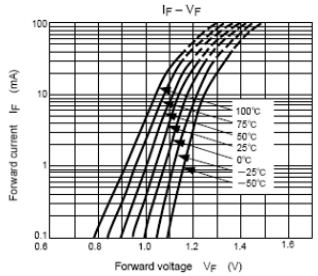


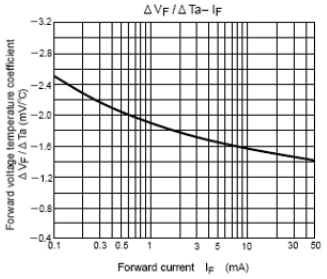


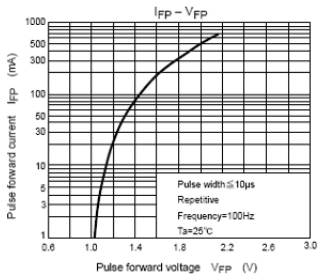


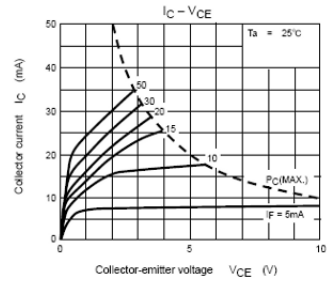


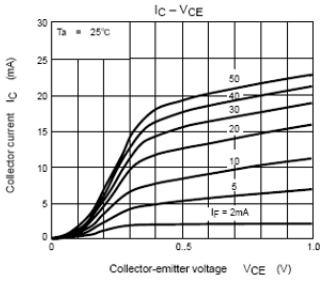


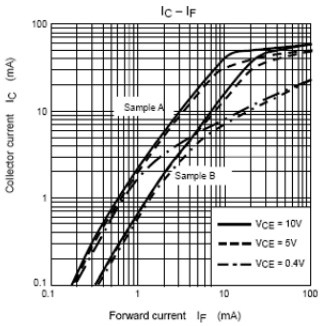


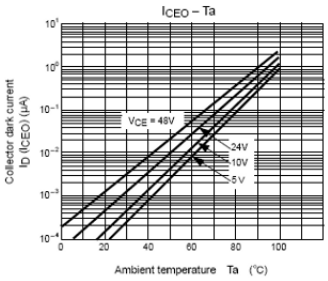


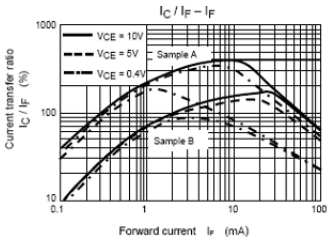


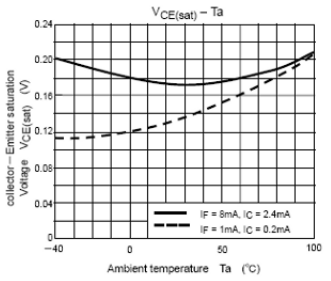

IC – VCE
Ta = 25°C
Collector current IC (mA)
50
40
30
20
15
10
PC(MAX.)
IF = 8mA
Collector-emitter voltage VCE (V)

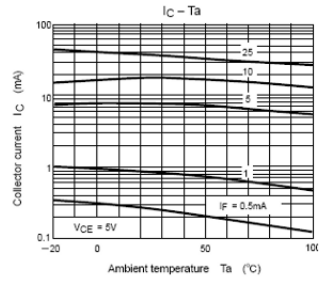

IC – VCE
Ta = 25°C
Collector current IC (mA)
50
40
30
20
10
5
IF = 2mA
Collector-emitter voltage VCE (V)

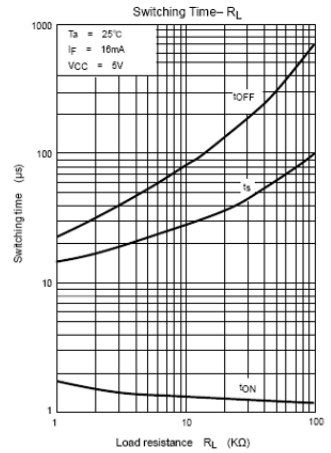

IC – IF
Collector current IC (mA)
Sample A
Sample B
VCE = 10V
VCE = 5V
VCE = 0.4V
Forward current IF (mA)

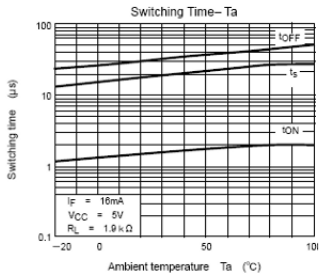

ICEO – Ta
Collector dark current ID (ICEO) (μA)
VCE = 48V
24V
10V
5V
Ambient temperature Ta (°C)


IC / IF – IF
Current transfer ratio IC / IF (%)
VCE = 10V
VCE = 5V
VCE = 0.4V
Sample A
Sample B
Forward current IF (mA)


VCE(sat) – Ta
collector – Emitter saturation Voltage VCE(sat) (V)
IF = 8mA, IC = 2.4mA
IF = 1mA, IC = 0.2mA
Ambient temperature Ta (°C)


IC – Ta
Collector current IC (mA)
25
10
5
1
IF = 0.5mA
VCE = 5V
Ambient temperature Ta (°C)


Switching Time– RL
Ta = 25°C
IF = 16mA
VCC = 5V
tOFF
ts
tON
Switching time (μs)
Load resistance RL (KΩ)


Switching Time– Ta
tOFF
ts
tON
IF = 16mA
VCC = 5V
RL = 1.9 kΩ
Switching time (μs)
Ambient temperature Ta (°C)

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